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Abstracts *January–April 1964*

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Scientific and Technical Aerospace Reports

FEB 18 1964

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JANUARY 8, 1964

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N64-10001 – N64-10668

JAN 29 1964

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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Scientific and Technical Aerospace Reports (STAR) is a comprehensive abstracting and indexing journal covering worldwide report literature on the science and technology of space and aeronautics. It is published twice each month.

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3. Scientific and technical articles prepared by employes of NASA and its contractors that appear in the learned and technical journals.

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Professional readers are encouraged to examine the abstracts in each category of interest. If time is short, and when interest is concentrated in specific areas, readers may wish alternatively to scan source, author, and subject indexes. A more thorough coverage of a subject field may often be achieved by detailed examination of the subject listings, especially as they are cross-indexed in the quarterly indexes.

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By special arrangement between NASA and the American Institute of Aeronautics and Astronautics, the AIAA publication *International Aerospace Abstracts* is issued in coordination with *STAR*. Each journal appears on alternate weeks. *IAA* uses identical subject categories with those in *STAR*, and publishes identical indexes. *IAA's* worldwide coverage of books and scientific and trade journals complements *STAR's* worldwide report coverage. The two publications thus provide comprehensive access to current literature on aerospace science and technology.

Organizations having contractual relations with NASA may obtain *IAA* by writing NASA, Code ATSS-A, Washington, D.C. 20546. Others should direct inquiries to the American Institute of Aeronautics and Astronautics, 750 Third Avenue, New York, N.Y., 10017

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National Aeronautics and Space Administration

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VOLUME 2 NUMBER 1

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

January 8, 1964

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Includes administration and management; space law and related legal matters; legislative hearings and documents; and symposia or conferences of a broad or a general nature.

N64-10040 American Institute of Aeronautics and Astronautics, New York, N.Y.
ENGINEERING PROBLEMS OF MANNED INTERPLANETARY EXPLORATION
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N64-10080 American Institute of Aeronautics and Astronautics, New York, N.Y.
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[Jan. 1963] 108 p refs Presented at the IAS 31st Ann. Meeting, N.Y., Jan. 21–23, 1963
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N64-10134 National Lead Company of Ohio, Cincinnati
Summary Technical Report for the Period July 1, 1963 to September 30, 1963 [PROPERTIES OF NUCLEAR REACTOR MATERIALS: URANIUM AND HYDROGEN FLUORIDE]
R. Burgett, ed. Oct. 28, 1963 46 p refs
(Contract AT(30-1)-1156)
(NCLO-890) OTS: $1.00

The temperature of molten uranium was measured indirectly by an infrared radiation pyrometer. The pyrometer was sighted on the crucible graphite pour plug during the entire melting cycle. The pour plug temperature was measured by an embedded thermocouple, and the molten bath temperature by an immersion thermocouple. The emissivities of graphite and molten uranium were determined, and a series of equations correlating pyrometer readings with melt temperatures was derived. Author

N64-10199 Joint Publications Research Service, Washington, D.C.
CONFERENCES AND RESEARCH IN THE FIELDS OF EARTH SCIENCES AND ASTRONOMY
V. A. Troitskaya, A. Kh. Khrgian, Yu. D. Bulanzhe, N. P. Ben'kova, N. Z. Pinus et al Oct. 25, 1963 71 p refs Transl. into ENGLISH of nine articles from Geofiz. Byul. (Moscow), no. 12, 1962 p 14–68 and 109–114
(JPRS-21-593; OTS-63-41003) OTS: $1.75

This report contains the following articles: (1) International Symposium on Geomagnetic Storms and Cosmic Rays; (2) Session of the International Aerological Commission; (3) The Problem of Changes of Climate of the Earth; (4) Fifth Conference of Representatives of Countries of the European–Asiatic Region, (5) Conferences on the Ionosphere; (6) Some Peculiarities of Wind Conversion in the Lower Stratosphere; (7) Geological Activity of the Eastern Antarctica Ice Cap; (8) Third All-Union Conference of the Section of the Ionosphere; and (9) Appendix: Report Read at the Third All-Union Conference of the Section on the Ionosphere. R.T.K.

N64-10209 Joint Publications Research Service, Washington, D.C.
EUROPE AND SPACE [First Report by EUROSPACE]
Nov. 15, 1963 98 p refs Transl. into ENGLISH and condensed from L'Homme et l'Espace (Lausanne), no. 16, July–Aug. 1963, p 7–44
(JPRS-21879; OTS-63-41144) OTS: $2.25

EUROSPACE is essentially an association of industrial firms and of professional organizations that are concerned with the scientific, technical, and industrial aspects of space activities. It is an association without a lucrative objective and, therefore, cannot participate in commercial and contractual negotiations that have profit as their object. Projects under study by EUROSPACE include: (1) space carriers, (2) meteorological satellites, (3) various nonclassical launching procedures, and (4) high-altitude, recoverable rocket probes. Also, the accomplishments of various European firms that are members of EUROSPACE are presented. I.v.L.

N64-10233 Deutsche Forschungsanstalt für Luft- und Raumfahrt, Brunswick (W. Germany)
SAFETY IN AIR TRAFFIC AS A RESEARCH OBJECTIVE OF THE FLIGHT SAFETY FOUNDATION (FSF) [DIE SICHERHEIT IM LUFTVERKEHR ALS FORSCHUNGSOBJEKT DER FLIGHT SAFETY FOUNDATION (FSF)]
H. Herb 1963 38 p refs In German
(DFL-208)

A thorough investigation of aircraft accidents is an important aid in increasing air-traffic safety. The investigation of the aircraft accident is the responsibility of the country in which the accident occurs. The International Civil Aviation Organization (ICAO) in Montreal compiles accident statistics on an international basis. The activity of the International Flight Safety Foundation (FSF) in New York is more extensive than that of the ICAO. The FSF is concerned more with the prevention of accidents than with accident investigations, which leads to research in the realm of air safety. This report discusses some important results of this research, two of which are: (1) minimum values of horizontal vision and lower ceiling exist for landing on various airfields; forty percent of known accidents occurred under weather conditions where only one of these values was satisfied; (2) seventy-five percent of all technical breakdowns is due to engine damage. I.v.L.

N64-10257 Iowa State U. of Science and Tech., Ames
ANNUAL SUMMARY RESEARCH REPORT OF CHEMISTRY, ENGINEERING, METALLURGY, PHYSICS AND REACTOR DIVISIONS Annual Summary Report, July 1, 1962–June 30, 1963
Sept. 1963 48 p refs
(Contract W-7405-eng-82)
(IS-700) OTS: $5.50

Abstracts of research projects for the period of July 1, 1962 to June 30, 1963, are presented. Chemistry topics include physical, inorganic, analytical, and structural chemistry, pyrometallurgy, and spectrochemistry. Engineering topics include chemical, nuclear, mechanical, and ceramic engineering. Topics in metallurgy include: metal preparation, purification, and related studies; phase equilibria and thermodynamic properties of alloys; mechanical properties of metals and alloys; solid-state investigation; and separation studies. Topics in physics include: nuclear and high-energy physics, including theoretical reports, nuclear physics of the synchrotron group, nuclear spectroscopy, and accelerator design; and solid-state physics, including metals and alloys, semiconductors, low-temperature and high-pressure studies, nuclear magnetic-resonance studies, and miscellaneous solid-state theory and methods. A report on the reactor utilization for the report period is also included. J.E.T.

N64-10262 Oak Ridge National Lab., Tenn.
METALS AND CERAMICS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING MAY 31, 1963
J. H. Frye, Jr. and J. E. Cunningham Nov. 11, 1963 284 p refs
(Contract W-7405-eng-26)
(ORNL-3470) OTS: $3.50

Progress in fundamental research, long-range and applied research, and reactor-development support is discussed. Some of the areas in the fundamental research program were crystal physics, reactions at metal surfaces, spectroscopy of ionic media, structure of metals, theory of alloying, deformation of crystalline solids, X-ray diffraction, and metallurgy of superconducting materials. Zirconium metallurgy, materials compatibility, solid reaction studies, fuel-element development, and mechanical properties research are some of the areas covered in the long-range and applied research program. Reactor development support included a gas-cooled reactor program, molten-salt reactor studies, high-flux isotope reactor studies, a space power program, advanced test-reactor studies, and a water desalination program. Programs in other research areas are also reported; these include a thermonuclear project and a transuranium program. C.L.W.

N64-10271 Argonne National Lab., Ill.
REPORTS TO THE AEC NUCLEAR CROSS SECTIONS ADVISORY GROUP MEETING AT UNIVERSITY OF COLORADO, AUGUST 13-14, 1963
A. B. Smith, comp. [Aug. 1963] 103 p refs
(WASH-1044)

These reports contain an informal statement of recent developments, changes in emphasis, and preliminary data which are of importance to the cross-section-measurement program of the AEC. The majority of the reports deal with accelerator programs and neutron physics. Contributors of the reports are: the Argonne National Laboratory, Columbia University, Duke University, the Los Alamos Scientific Laboratory, the Oak Ridge National Laboratory, the Phillips Petroleum Company, the William Marsh Rice University, the Brookhaven National Laboratory, and the Case Institute of Technology. I.v.L.

N64-10294 National Science Foundation, Washington, D.C.
FEDERAL ORGANIZATION FOR SCIENTIFIC ACTIVITIES, 1962
[1962] 607 p refs
(NSF-62-37) GPO: $3.50

This report delineates the organization of the Federal Government for scientific activities, and describes the advisory and coordinating mechanisms involved in scientific activities, field stations, and installations involved in scientific activities and federally supported research centers. Also given are the major developments in organization for scientific activities since 1954. It provides a reference and an indication of the direction in which the Federal organization for scientific activities has been moving, reflecting organization changes and trends. Narrative statements, accompanied by organization charts, describe the general functions and scientific activities of departments and agencies of the Government that are engaged in scientific activities. Detailed information is given on scientific research and development, scientific extramural training, and scientific and technical information activities. Additional functions covered include intramural training of scientific manpower, scientific data collection, and scientific testing and standardization. C.L.W.

N64-10300 Advisory Group for Aeronautical Research and Development, Paris (France)
AGARD GENERAL INFORMATION 1963
[1963] 40 p refs

The technical activity of AGARD is conducted by Panels working on selected research and development areas of particular importance to NATO. The Panels are composed of experts, appointed by the member nations, who meet generally twice each year to plan and coordinate their continuing work. The problems studied have been selected by the nations or have arisen from particular requests for advice from other NATO commands or organizations. AGARD General Information has been prepared to give some idea of these problems and the ways in which they have been approached. I.v.L.

N64-10301 Tokyo U. (Japan) Inst. of Industrial Science
THE INSTITUTE OF INDUSTRIAL SCIENCE, THE UNIVERSITY OF TOKYO [Annual Report for 1963]
[Mar.] 1963 27 p refs

The research activities and the objectives of the Institute of Industrial Science, University of Tokyo, are discussed, and features of the physical facilities of each department are described. C.L.W.

N64-10348* National Aeronautics and Space Administration, Washington, D.C.
THE FUTURE IMPACT OF SPACE TECHNOLOGY News Release No. 62-30
Morton J. Stoller Feb. 15, 1962 23 p Address before the Natl. Security Ind. Assoc., Philadelphia
Available from NASA. Office of Scientific and Technical Information, Wash., D.C.

A discussion of the future impact of space technology is presented. Also presented are general descriptions of the future plans for space research, lunar exploration, and space technology. P.V.E.

N64-10350* National Aeronautics and Space Administration, Washington, D.C.
THE MANNED SPACE FLIGHT PROGRAM – ITS SIGNIFICANCE AND ECONOMIC IMPLICATIONS News Release
D. Brainerd Holmes Nov. 15, 1962 11 p Address before the Natl. Ind. Conf. Board, Chicago
Available from NASA. Office of Scientific and Technical Information, Washington, D.C.

Why go to the moon when it costs so much in dollars, brainpower, and effort? Developing the know-how and technology to get to the moon, a know-how and technology which can be employed in many space applications, is perhaps more important than the lunar landing itself, according to D. Brainerd Holmes, Director, Office of Manned Space Flight, NASA. Also, he says that committing ourselves to space has economic implications beyond the costs involved. The national enterprise involved in the goal of manned lunar landing and return within the decade is a critically important activity for the future of this nation as an industrial and world power. The development of space science and technology will strengthen our whole industrial base, and serve as effective insurance against technological obsolescence. I.v.L.

N64-10351* National Aeronautics and Space Administration, Washington, D.C.
INDUSTRY'S ROLE IN THE NATIONAL SPACE PROGRAM News Release
James E. Webb Dec. 18, 1962 8 p Address before the Ill. Mfr. Assoc. Ann. Banquet, Chicago, Dec. 18, 1962
Available from NASA. Office of Scientific and Technical Information, Washington, D.C.

Industry's role in the national space program, particularly industry in Chicago and the Midwest, is presented. The nation's total goals in space, an outline of some of the considerations which make it imperative that these goals be achieved, and a description of some of the progress which has been made toward achieving them is also presented. P.V.E.

N64-10380 Joint Publications Research Service, Washington, D.C.
FOREIGN DEVELOPMENTS IN MACHINE TRANSLATION AND INFORMATION PROCESSING NO. 143: A FUNDAMENTAL MONOGRAPH ON THE THEORY OF PERCEPTRONS. (REVIEW OF ROSENBLATT'S "PRINCIPLES OF NEURODYNAMICS")
O. G. Ivakhnenko, V. V. Kleshchov, G. L. Otkhezuri, and M. I. Shlezinger Nov. 8, 1963 15 p refs Transl. into ENGLISH from Avtomat (Kiev), no. 3, 1963 p 84-90
(JPRS-21805; OTS-63-41106) OTS: $0.50

Basic concepts of the principles of neurodynamics are: (1) the avowal of a "neuron doctrine," which asserts that the actual properties of the brain are connected with the topology of a combination of neurons and the dynamics of the passage

of impulses in the nerve nets; and (2) the avowal that the ability of a biological system to handle information does not depend on any sort of "vital force" which cannot be modeled by means of artificial instruments created by man. By this is affirmed the possibility of creating artificial models of the brain. Two approaches to the problem of creating models of the brain are the monotypic and the genotypic. The author is an adherent of the latter approach. Three types of control can be used for training the perceptron (brain model): S-reinforcement, R-reinforcement, and ($R^* - r^*$)-reinforcement. Three methods can be used for training a perceptron: (1) mathematical analysis, (2) modeling on universal computers, and (3) making physical models, element by element. The theory of perceptrons composed of three layers of series-coupled units—three layer or minimal S-A-R perceptrons—is examined. Also reviewed are multilayer perceptrons, cross-coupled perceptrons, and back-coupled perceptrons. I.v.L.

N64-10381 Joint Publications Research Service, Washington, D.C.
COMPUTATION AND MEASUREMENT OF SPEECH INTELLIGIBILITY
N. B. Pokrovskiy Nov. 18, 1963 350 p refs Transl. into ENGLISH of a book "Raschet i Izmereniye Razborchivosti Rechi", Moscow, Svyaz'izdat, 1962 p 1–391
(*Its* Foreign Develop. in Machine Transl. and Inform. Process. No. 44)
(JPRS-21-885; OTS-63-41146) OTS: $5.00

This monograph presents a theory of speech intelligibility, and gives a qualitative and quantitative description of the properties and acoustical characteristics of speech and hearing which determine the amount of phonetic and semantic information conveyed by telephone and radiotelephone communications channels. It contains a description of the methods of experimental determination of speech intelligibility by articulation measurements, describes the technique of analytic calculation on the basis of channel parameters, and presents a comparison of the articulation method with other possible ways of evaluating the quality of speech transmission. It also presents the fundamentals of computing optimal electroacoustical characteristics of voice channels in telephone and radiotelephone apparatus, and deals with some of the outstanding problems in the field of voice transmission quality. Author

N64-10434 United Nations. General Assembly. Committee on the Peaceful Uses of Outer Space
INFORMATION RELATING TO OUTER SPACE ACTIVITIES SUPPLIED ON A BASIS IN ACCORDANCE WITH GENERAL ASSEMBLY RESOLUTIONS 1721 B (XVI) AND 1802 II (XVII)
Oct. 4, 1963 9 p refs
(A/AC.105/11/Add.3)

A summary of outer space activities of Argentina and the Philippines is presented. P.V.E.

N64-10435 United Nations. General Assembly. Committee on the Peaceful Uses of Outer Space
VERBATIM RECORD OF THE TWENTY-SECOND MEETING HELD AT HEADQUARTERS, NEW YORK ON FRIDAY, 13 SEPTEMBER 1963
Oct. 10, 1963 35 p refs
(A/AC.105/PV-22)

A verbatim record of the twenty-second meeting of the Committee on the Peaceful Uses of Outer Space is presented. Discussion was held on the report of the Scientific and Technical Sub-Committee concerning the work of its second session, and the reports prepared, by the World Meteorological Organization, the International Telecommunication Union, and the Legal Sub-Committee. P.V.E.

N64-10459 Joint Publications Research Service, Washington, D.C.
RARE PHENOMENA "VISION" IN THE FINGERS OF ROSA KULESHOVA
N. D. Nyuberg (Acad. Sci. USSR) July 3, 1963 20 p Transl. into ENGLISH from Priroda (Moscow), no. 5, 1963 p 61–67
(JPRS-20012; OTS-63-31199) OTS: $0.50

Experiments are described which tested the ability of a young woman to use her finger tips to read ordinary printed text while blindfolded, and to distinguish colors even when in total darkness. The results of the experiments indicated that she had an ability to do so. P.V.E.

N64-10507 Joint Publications Research Service, Washington, D.C.
HORIZONS OF SCIENCE
V. Leshkovtsev Apr. 30, 1963 110 p refs Transl. into ENGLISH of Pamphlet "Gorizonty Nauki", Moscow, 1963 p 1–48
(JPRS-19016; OTS-63-21735) OTS: $2.50

The future of science and technology and the approaching scientific and technological revolution with the changes which it will make are discussed under the following headings: (1) the tempo of scientific development; (2) the energy of tomorrow; (3) the new industrial revolution (automated factories and man); (4) new materials, new possibilities; (5) radio electronics and molecular electronics; (6) electronic technology—the technology of communism; (7) the revolution being prepared by cybernetics; (8) biology and medicine—for mankind; (9) the conquest of the cosmos; and (10) a direct method to produce electrical energy. P.V.E.

N64-10573 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM TEKHNIKA-MOLODEZHI
L. Berne and L. Bobrov Mar. 20, 1963 16 p refs Transl. into ENGLISH of two articles, (Moscow), no. 12, Dec. 1962, p 28–30, 34–36
(JPRS-18235; OTS-63-21367) OTS: $0.50

The production of man-made clouds, and the investigation of the earth's crust, mantle, and core by drilling are discussed in two articles. In the first, an instrument (meteotron) is described which, by burning a ton of diesel fuel per minute, locally overheats the air. The object of the instrument is the creation of clouds when and where a necessity arises. The second paper discusses Soviet plans for investigating the earth's interior by drilling five holes 10 to 15 km deep. The holes will be drilled in areas where: (1) the thickness of the earth's sedimentary rock is the greatest, (2) the most ancient granites of the country exist, (3) a mountain range exists, (4) the basaltic layer comes closest to the earth's surface, and (5) the layer of the earth's crust is the thinnest on land. A brief discussion of the American Mohole project is also presented. P.V.E.

N64-10598 Joint Publications Research Service, Washington, D.C.
NEW THOUGHTS AND METHODS IN OPTICAL PLANNING
Sandor Majoros (Hung. Opt. Works Res. Lab.) Nov. 21, 1963 22 p Transl. into ENGLISH from Kep Hangtech. (Budapest), v. 9, no. 4, Aug. 1963 p 97–105
(JPRS-21979; OTS-63-41194) OTS: $0.75

This article deals with statoptical concepts which may be utilized in optical planning using a determinant method to perform the computations. The discussion includes the development of theories and methods connected with designing optical systems, comparison of the homocentric light beam with the jointed rod chain known from statics, the role of the determinant method in the development of the statoptic theory, a description of a statoptic model of the homoaplanar system, and resolution of the designing of polyachromatic systems by the determinant method. C.L.W.

N64-10624* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
PUBLICATIONS OF THE JET PROPULSION LABORATORY, JULY 1962 THROUGH JUNE 1963
Suzanne Kresser, comp. Aug. 30, 1963 77 p refs
(NASA Contract NAS7-100)
(JPL Bibl-39-4) OTS: $7.60 ph, $2.51 mf

The bibliography has been divided as follows: (1) Technical reports and memorandums—technical reports are designed to report on the completion of a recognizable phase, on a single significant development, on the completion of an entire program, or record data or a development growing out of an assigned program but not directly related to it; technical memorandums report the result of a special study of a problem, provide preliminary information on a program, or present any other material which is intended for a limited audience. (2) Summary publications—documentation of confidential work being performed in the field of nondestructive testing of solid-propellant motors. (3) Astronautics information—report and open literature citations included are restricted to the subject of spaceflight and to applicable data and techniques. R.T.K.

02 AERODYNAMICS OF BODIES, COMBINATIONS, AND INTERNAL FLOW

Includes aerodynamics of channels, cowls, ducts, ejectors, nozzles, etc. *For related information see*: 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 11 Fluid Mechanics.

N64-10016 Aeronautical Research Council (Gt. Brit.)
THEORETICAL ANALYSIS OF A GUST ALLEVIATOR USED ON A LANCASTER AIRCRAFT AND COMPARISON WITH EXPERIMENT
J. K. Zbrozek London, Ministry of Aviation, 1963 12 p refs
(ARC R&M-3326; replaces RAE-AERO-2645; ARC-22856)
HMSO: 5s

A theoretical analysis of a gust alleviator using the spectral technique is made, and the results compared with experiment. The comparison is made in terms of the frequency of occurrence of normal accelerations at the aircraft center of gravity. The estimated loss of alleviator effectiveness with increasing magnitude of the normal acceleration and with increasing static alleviation is in close agreement with the observed phenomena, which the single-gust approach failed to explain. The importance of turbulence of wavelengths longer than 1000 ft is emphasized. Author

N64-10044* Astro Research Corp., Santa Barbara, Calif.
LOW DENSITY, AUTOROTATING WINGS FOR MANNED REENTRY, PART I: CONCEPTS OF ROTARY WING ATMOSPHERIC ENTRY
H. Schuerch and R. Mac Neal *In* Am. Inst. of Aeron. and Astronautics Eng. Problems of Manned Interplanetary Exploration Oct. 1963 p 46–56 refs (See N64-10040 01-01) AIAA: $4.00 members, $8.00 nonmembers
(Supported by NASA)

A summary is presented of some of the aerodynamic and structural concepts that have been developed in the course of an initial, exploratory study of rotary atmospheric entry aids. Areas of discussion are: (1) variable geometry rotors; (2) isothermal atmospheric entry—drag modulation and lift modulation; (3) analytical design of bladed rotors; (4) materials selection for high-temperature rotors; (5) experiments—bladed rotors, fluted cone, and spiral net; and (6) applications. P.V.E.

N64-10051 Aeronautical Research Council (Gt. Brit.)
THE BUCKLING OF PLATES TAPERED IN PLANFORM
G. G. Pope London, HMSO, Apr. 1962 27 p refs
(ARC-R&M-3324; replaces RAE-R-STRUCT-274; ARC-23913)
HMSO: 10s

An analysis is given of the buckling of a plate of constant thickness, tapered symmetrically in planform, and subjected to uniform compressive loading on the parallel ends. Two cases are considered: (1) different uniform loads applied normal to the ends, equilibrium being maintained by shear flows along the sides; (2) equal uniform stresses applied normal to the ends, with displacement of the sides prevented normal to the direction of the taper. Opposite pairs of edges are either simply-supported or clamped. Author

N64-10056* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTAL AND THEORETICAL PRESSURES ON BLUNT CYLINDERS FOR EQUILIBRIUM AND NONEQUILIBRIUM AIR AT HYPERSONIC SPEEDS
Donald M. Keuhn Washington, NASA, Nov. 1963 47 p refs
(NASA TN D-1979) OTS: $1.25

Pressure distributions and shock-standoff distances were obtained in air for three blunt, stream-alined cylinders at a nominal Mach number of 15. Equilibrium stagnation temperature was about 3,600° R, which corresponds to an isentropic exponent in the stagnation region of the model of about 1.25 for the present test conditions. The models were highly cooled. Reynolds numbers based on free-stream properties for equilibrium flow and on cylinder diameter were 2,400 and 6,200. The experimental data indicated nonequilibrium flow in the stagnation region for some of the models. Viscosity effects appeared to be negligible. Comparison of experiment and theory showed that several theoretical methods provided good estimates of the pressures on blunt cylinders. Author

N64-10057* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
REAL-GAS HYPERSONIC-NOZZLE FLOW PARAMETERS FOR NITROGEN IN THERMODYNAMIC EQUILIBRIUM
Frank L. Clark and Charles B. Johnson Washington, NASA, Nov. 1963 20 p refs
(NASA TN D-2019) OTS: $0.50

Some of the more commonly used real-gas hypersonic-nozzle flow parameters have been calculated and charted for nitrogen in thermodynamic equilibrium; the study covered a range of stagnation pressures up to 1,000 atm and stagnation

temperatures from 1,800° R to 5,000° R. It is shown that significant error can be incurred in the values of the various flow parameters by using the ideal-gas relationship, particularly at the higher stagnation pressures. Author

N64-10072* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SOME PRESSURE-DRAG EFFECTS OF ROUNDING THE LEADING EDGES OF HYPERSONIC INLETS
E. Floyd Valentine Repr. from AIAA J., 1963 p 1918–1919 refs
(NASA RP-49)

Pressure-drag effects on the rounded leading edge of hypersonic inlets, and the pressure-drag effects resulting from changes in pressure further back on the conical surface caused by rounding the leading edge, are considered. The results of calculations of the outer surface pressure-drag coefficient and the total external pressure-drag coefficient for slender bodies that increase in length as M_∞ increases are plotted. The curves show that the effect of leading-edge bluntness on the outer-surface pressure-drag coefficient is minor, whereas, for even modest amounts of leading-edge rounding, the leading-edge drag is the major portion of the drag. Consideration of sweeping the leading edges showed possibilities of markedly decreasing the drag penalty associated with the necessity of having rounded leading edges. M.P.G.

N64-10082* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THEORY OF THE TUMBLING AND SUBSEQUENT LARGE-AMPLITUDE OSCILLATIONS OF VEHICLES ENTERING PLANETARY ATMOSPHERES
Victor L. Peterson and Murray Tobak *In* Am. Inst. of Aeron. and Astronautics Proc. of the Aerospace Forum I Session Jan. 1963 p 74–81 refs (See N64-10080 01-01) AIAA: $4.00 members, $8.00 nonmembers

The tumbling and subsequent large-amplitude oscillatory motion of vehicles entering planetary atmospheres is analyzed. An asymptotic solution for the oscillatory motion is derived in a form that illustrates its functional dependence on vehicle and planetary properties. It is shown how the results can be used to make rapid and accurate estimates of the oscillatory amplitudes in relation to aerodynamic heating and aerodynamic loads. Author

N64-10131* National Aeronautics and Sapce Administration. Langley Research Center, Langley Station, Va.
FLUTTER ANALYSIS OF FLAT RECTANGULAR PANELS BASED ON THREE-DIMENSIONAL SUPERSONIC POTENTIAL FLOW
H. J. Cunningham Repr. from AIAA J., v. 1, no. 8, Aug. 1963 p 1795–1801 refs Presented at the IAS 31st Ann. Meeting, N.Y., Jan. 21–23, 1963
(NASA RP-44)

A procedure has been developed for computing flutter characteristics of single finite panels, particularly at low supersonic Mach numbers, where static and quasi-static aerodynamic approximations are not valid. Air forces from exact linearized potential-flow theory are used. The panel is considered as finely divided into many boxes, and the aerodynamic influence coefficients between all pairs of boxes are computed by numerical integration. The flutter analysis is a modal type of analysis which can be used with the box method for calculation of the flutter stability of any flat or nearly flat panel, whether of isotropic or anisotropic stiffness, and even for buckled panels for which the flutter is a small-amplitude, simple harmonic, superimposed motion to which linear theory would apply. Author

N64-10136* Smithsonian Astrophysical Observatory, Cambridge, Mass.
ATMOSPHERIC HEATING IN THE AURORAL ZONES: A PRELIMINARY ANALYSIS OF THE ATMOSPHERIC DRAG OF THE !NJUN III SATELLITE Research in Space Science
Luigi G. Jacchia and Jack Slowey Sept. 17, 1963 21 p refs
(NASA Grant NsG-87-60)
(NASA CR-52456; SAO Special Rept.-136) OTS: $2.60 pa, $0.83 mf

Injun III is a near-spherical object in an orbit with eccentricity 0.16, inclination 70°.4, and a mean perigee height of 250 km. An analysis of the drag during the first half-year after launching has revealed: (1) that on geomagnetically quiet drags, the upper-atmosphere temperature in the auroral zones is essentially the same as at the equator; (2) that the heating that accompanies geomagnetic perturbations in the auroral zones is four or five times greater than the heating experienced during these perturbations in low latitudes. In addition, the present analysis gives a calibration of atmospheric models at the critical height of 250 km. The amplitude of the diurnal temperature oscillation is found to be smaller than expected, but the cause of the discrepancy may lie in part with the atmospheric model. Author

N64-10138 Aeronautical Research Council (Gt. Brit.)
PRESSURE MEASUREMENTS ON A CONE-CYLINDER-FLARE CONFIGURATION AT M = 6.85 AND INCIDENCES UP TO 30°
D. H. Peckham London, Min. of Aviation, 1963 19 p refs
(ARC-CP-657; supersedes RAE-TN-AERO-2806, ARC-23691) Available from HMSO: 3s 6d

Pressure and force measurements were made on a slender cone-cylinder-flare configuration, slightly blunted at the nose, over an incidence range of 0° to 30° at a Mach number of 6.85. Although force measurements showed good agreement with Newtonian theory, examination of local pressure distributions revealed considerable departures from theory. Author

N64-10152 Joint Publications Research Service, Washington, D.C.
STUDIES ON THE EFFECTS OF AEROIONS OF DIFFERENT POLARITIES
G. K. Trofimov Nov. 7, 1963 14 p refs Transl. into ENGLISH of two articles from Izv. Akad. Nauk KaSSR (Alma-Ata), no. 2, 1963 p 68–79
(JPRS-21777; OTS-63-41091) OTS: $0.50

The effect of aeroions of different polarities on the change in complement titer, and the effect of aeroions of different polarities on the outcome and pattern of anaphylactic shock in rabbits are discussed. Conclusions reached in studying the change in complement titer include: (1) both sensitization and the use of a course of aeroionization with different polarities during the sensitization period failed to produce changes in the complement titer; (2) no relationship could be determined between the severity of shock and the change in the complement titer; (3) neither a single session nor a course of aeroionization of different polarities has an effect on the reduction of complement titer during anaphylactic shock; and (4) change in the complement titer is not the cause of the milder picture of shock in animals receiving various ions. Conclusions reached in studying the outcome and pattern of anaphylactic shock in rabbits included the following: (1) a single session of negative or positive aeroions does not exert any essential effect on the pattern or outcome of anaphylactic shock; (2) a course of negative and positive aeroions exerts a pronounced desensitizing effect; it mitigates the course of anaphylactic shock considerably and protects the majority of animals against death; and

(3) the desensitizing effect of a course of aeroionization is associated with the capacity of aeroions for producing a cumulative effect. P.V.E.

N64-10155* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
EFFECTS OF EXHAUST NOZZLE RECOMBINATION ON HYPERSONIC RAMJET PERFORMANCE: I. EXPERIMENTAL MEASUREMENTS
Erwin A. Lezberg and Leo C. Franciscus Repr. from AIAA Journal v. I, no. 9, Sept. 1963 p 2071–2076 refs Presented at the AIAA-ASME Hypersonic Ramjet Conf., White Oak, Md., Apr. 23–25, 1963

Experimental temperature measurements have been made, in supersonic nozzles with cone exit half-angles of 10.5° and 7°, for hydrogen-air and methane-air combustion products at stagnation temperatures up to 5400°R and pressures up to 4.5 atm. The results indicate freezing in the vicinity of the nozzle throat. Comparisons of the data with an approximate freezing-point analysis and an exact calculation showed good agreement with both. Preliminary spectral absorption measurements for the OH $^2\Sigma^+ - ^2\Pi$ electronic transition were made by using the curve of growth to determine concentration and to demonstrate feasibility of spectroscopic concentration measurements. Author

N64-10183* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A WIND-TUNNEL INVESTIGATION OF THE EFFECT OF CHANGES IN BASE CONTOUR ON THE DAMPING IN PITCH OF A BLUNTED CONE
William R. Wehrend, Jr. Washington, NASA Nov. 1963 25 p refs
(NASA TN D-2062) OTS: $0.75

The configuration variables studied were changes in the radius of the spherical base, modifications to one of the bases in the form of steps in the surface of the base, and annular fences normal to the base surface. The configurations with spherical bases had unstable damping in the subsonic speed range, and the base modifications partially corrected this effect. The Mach number range was from 0.25 to 2.20, and the angle-of-attack range from −4° to +18°. Author

N64-10184* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
EXPERIMENTAL INVESTIGATION OF A 4.64-INCH-MEAN-DIAMETER THREE-STAGE REVERSE-FLOW REENTRY TURBINE
Donald E. Holeski and William T. Wintucky Washington, NASA Nov. 1963 27 p refs
(NASA TN D-2076) OTS: $0.75

A three-stage reverse-flow reentry turbine was designed and evaluated experimentally in cold air. This turbine was designed for a blade- to jet-speed ratio of 0.244, a total- to static-pressure ratio of 14.5, and a rotative speed of 22,436 rpm. At design-point operation, the equivalent specific work output obtained was 38 Btu/lb at a static efficiency of 0.57. The overall turbine performance, the first-stage performance, and a discussion of the weight-flow distribution, as caused by leakage flow, are presented. Author

N64-10248 Air Force Systems Command, Wright-Patterson AFB, Ohio
THE HYPERSONIC AREA RULE
M. D. Ladyzhenskiy Jan. 3, 1963 12 p refs Transl. into ENGLISH from Inzh. Zh., v. 1, no. 1, 1961 p 159–163
(FTD-TT-62-1311/1+2+4; AD-295787)

The hypersonic area rule has been formulated stating that all the mass of a gas is concentrated in an infinitely thin layer contiguous to the shock wave. According to this rule, when thin, nonaxisymmetric blunt bodies with the same bluntness drag values and the same laws of transverse area change in the direction of the stream are subjected to flow, the shock-wave surfaces, the laws of pressure change, and consequently the forces of resistance acting on the body coincide, and in this process the surfaces of the shock waves have axial symmetry. Author

N64-10291* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
EFFECTS OF EXHAUST NOZZLE RECOMBINATION ON HYPERSONIC RAMJET PERFORMANCE: II. ANALYTICAL INVESTIGATION
Leo C. Franciscus and Erwin A. Lezberg Repr. from AIAA Journal, v. I, no. 9, Sept. 1963 p 2077–2083 refs Presented at the AIAA-ASME Hypersonic Ramjet Conf., White Oak, Md., Apr. 23–25, 1963
(NASA RP-56)

Exhaust nozzle recombination studies are carried out for hydrogen-fueled subsonic combustion ramjet engines. Bray's criterion is used to determine a nozzle freezing point. Nozzle performance is calculated by assuming equilibrium conditions up to the freezing point and frozen flow from the freezing point to the nozzle exit. Several engine parameters are varied in order to determine their effect on recombination and specific impulse. These parameters include nozzle throat size, throat radius of curvature, nozzle shape, Mach number, altitude, equivalence ratio, and inlet kinetic energy efficiency. The study has shown that recombination losses are not expected to be serious for Mach numbers up to 9 and freestream dynamic pressures above 500 psf. Author

N64-10308* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROBLEMS OF ATMOSPHERIC WIND INPUTS FOR MISSILE AND SPACE VEHICLE DESIGN
James R. Scoggins, and William W. Vaughan N.Y., Am. Inst. of Aeron. and Astronautics [1963] 7 p refs Presented at AMS Meteorol. Support for Aerospace Testing and Operations Meeting, Colo. State U., July 10–12, 1963
(AIAA Paper 63-296) AIAA: $0.50 members, $1.00 nonmembers

The present study outlines the significance of wind inputs, reviews current high resolution wind measuring programs, and some results of current investigations of high resolution wind profile measurements regarding turbulence. The study is concerned with the inflight or midaltitude (~8 to 15 km) wind input problems. The following topics are discussed: (1) significance of wind inputs—design philosophy, types of wind inputs and examples of wind input influence on design, (2) discussion of high-resolution wind-measuring programs—FPS-16 radar–spherical balloon technique, and smoke trail–photographic technique. R.T.K.

N64-10335* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF AFTERBODY GEOMETRY AND STING DIAMETER ON THE AERODYNAMIC CHARACTERISTICS OF SLENDER BODIES AT MACH NUMBERS FROM 1.57 TO 2.86
Dennis E. Fuller and Victor E. Langhans Washington, NASA, Nov. 1963 29 p refs
(NASA TN D-2042) OTS: $0.75

An investigation has been made in the low Mach number test section of the Langley Unitary Plan wind tunnel to determine the effects of afterbody boattail, camber, and length, and of variations in sting diameter on the aerodynamic characteristics of slender bodies. A common forebody was utilized for all configurations tested. Tests were performed at Mach numbers from 1.57 to 2.86 and at a Reynolds number per foot of 3.0×10^6. Author

N64-10402 Aeronautical Research Council (Gt. Brit.)
ESTIMATION OF STABILITY DERIVATIVES (STATE OF THE ART)
H. H. B. M. Thomas London, Min. of Aviation, 1963 53 p refs
(ARC-CP-664; supersedes RAE-TN-AERO-2776, ARC-23160)
Available from HMSO: 9s 6d

The methods at present available for the estimation of the usual longitudinal and lateral stability derivatives of an aircraft are briefly discussed for each derivative. This is preceded by a section dealing with trends in aircraft geometry and their implications regarding the stability derivatives. To illustrate this further, the general discussion of methods is followed by a more detailed consideration of the estimation of these derivatives for a slender-wing-type aircraft, mainly at low speeds, when incidence effects are shown to be important. Author

N64-10519* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STEADY-STATE CHARACTERISTICS OF A DIFFERENTIAL-PRESSURE SYSTEM FOR EVALUATING ANGLES OF ATTACK AND SIDESLIP OF THE RANGER IV VEHICLE
E. Carson Yates, Jr., and Annie G. Fox Washington, NASA, Nov. 1963 20 p refs
(NASA TN D-1966) OTS: $0.50

An investigation has been conducted in the Langley 26-inch transonic blowdown tunnel at Mach numbers from 0.58 to 1.31 to examine some of the characteristics of a differential-pressure system used to measure flow angles over the hemisphere-cone nose of the Ranger IV vehicle. The differential pressures were measured between two orifices located in the pitch plane at 45° off the center line of the hemisphere nose. The effects of variations in Mach number, Reynolds number, pitch angle, and combined pitch and yaw angles on the differential-pressure characteristics were studied. The results indicated that, for a given total pressure and Mach number, the differential pressure varied linearly with pitch angle and was unaffected by variations in Reynolds number and yaw angle within the range of this investigation. As Mach number increased above 1, a decreasing effect of afterbody shape was shown. Author

N64-10520* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
JET EFFECTS AT SUPERSONIC SPEEDS ON BASE AND AFTERBODY PRESSURES OF A MISSILE MODEL HAVING SINGLE AND MULTIPLE JETS
Nickolai Charczenko and Clyde Hayes Washington, NASA, Nov. 1963 42 p refs
(NASA TN D-2046) OTS: $1.00

An investigation was made to determine pressure distribution on the base and the afterbody of a missile configuration with and without jet flow and incorporating one, two, three, four, and six nozzles. For one- and two-nozzle configurations, or for a flared-afterbody configuration, changes in the jet pressure ratio had little effect on afterbody pressure coefficient at any of the test Mach numbers. Cylindrical afterbody configurations with more than two nozzles, however, led to an increase in pressure coefficient over the rearmost part of the afterbody at the higher jet pressure ratios. Nozzle arrangements enclosing portions of the base area led to large positive values of base pressure coefficient at high values of jet pressure ratio. This result was caused by jet boundary interaction, which forced exhaust gases into the base and hence radially outward between the nozzles. Author

N64-10617* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
AERODYNAMIC CHARACTERISTICS OF A SPOILER-SLOT-DEFLECTOR CONTROL ON A 45° SWEPTBACK-WING-FUSELAGE MODEL AT HIGH SUBSONIC SPEEDS
Alexander D. Hammond Washington, NASA Nov. 1963 78 p refs
(NASA TN-D-2037; supersedes NASA TM-X-205) OTS: $2.00

An investigation was made in the Langley high-speed 7- by 10-foot tunnel for a Mach number range from 0.60 to 0.95 to determine the lateral-control and hinge-moment characteristics of a spoiler-slot-deflector configuration on a half model of a 45° sweptback-wing–fuselage combination. The tests were made at angles-of-attack from −4° to 20°, or the angle-of-attack limited by tunnel power. The tests were made for spoiler projections from zero to 8-percent wing chord, with the deflector at various projections from zero to the projection of the spoiler, or to a maximum, which was mechanically limited to 7 percent of the wing chord. The results of the investigation indicate that a spoiler-slot-deflector configuration having an increasing ratio of deflector projection to spoiler projection with increasing control projection would have good rolling effectiveness and generally low total hinge moments throughout the angle-of-attack and Mach number range of the investigation. Author

03 AERODYNAMICS OF WINGS, ROTORS, AND CONTROL SURFACES

Includes ailerons; airfoil sections; cascades; fans; flaps; propellers; rotors; slats; spoilers; etc. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 11 Fluid Mechanics.

N64-10052 Aeronautical Research Council (Gt. Brit.)
THE BENDING UNDER NORMAL LOADING OF PLATES TAPERED IN PLANFORM
G. G. Pope London, HMSO, Apr. 1962 24 p 4 refs
(ARC-R&M-3325; replaces RAE-R-STRUCT-273; ARC-23975)
HMSO: 9s

An analysis is given of the deformation under normal loading of a plate tapered symmetrically in planform with edges either clamped or simply supported. The thickness may be constant or may vary along the plate as a power of the width. Numerical results are given for plates of constant and linearly varying thickness under uniformly distributed load. Author

N64-10054 Aeronautical Research Council (Gt. Brit.)
THE COMPARISON OF THEORY AND EXPERIMENT FOR OSCILLATING WINGS
W. E. A. Acum London, HMSO, Mar. 1962 74 p refs
(ARC-CP-681; replaces NPL-AERO-1005; ARC-23640)
HMSO: 13s

The comparison between experimental and theoretical values of the aerodynamic derivatives for wings and controls in oscillating motion for subsonic, transonic, and supersonic flight in two or three dimensions is discussed. The success or failure of theory in predicting derivatives is summarized for the two most common experimental situations, namely, pitching of rigid wing and rotation of a rigid trailing-edge control. R.T.K.

N64-10055 Aeronautical Research Council (Gt. Brit.)
BOUNDARY LAYER CHARACTERISTICS OF CARET WINGS
D. Catherall London, HMSO, May 1963 31 p refs
(ARC-CP-694; replaces RAE-TN-AERO-2835; ARC-24222)
HMSO: 7s 6d

The theory of laminar boundary layers along flat surfaces has been used in conjunction with Eckert's "Intermediate Enthalpy" method to obtain approximations to the displacement thickness, skin friction, and temperature profiles on the undersurface of a Caret wing configuration. To a first approximation, it has been assumed that parallel flow exists behind the shock outside the boundary layer, and the displacement of the shock by the boundary layer near the leading edge is neglected. Conduction of heat within the body and along the surface is neglected, but radiation is included, so that 'local' values of equilibrium temperature are found. Examples are given for various altitudes and configurations, and the effect of the skin friction on the lift/drag ratio calculated, assuming the undersurfaces to be plane. Author

N64-10139 Aeronautical Research Council (Gt. Brit.)
PROVING TESTS OF A WINGTIP PARACHUTE INSTALLATION ON A VENOM AIRCRAFT, WITH SOME MEASUREMENTS OF DIRECTIONAL STABILITY AND RUDDER POWER
F. W. Dee London, Min. of Aviation, 1963 36 p refs
(ARC-CP-658; supersedes RAE-TN-AERO-2824, ARC-24280)
Available from HMSO: 7s 6d

A trial installation of a wingtip parachute has been made on a De Havilland Venom N.F.3 aircraft to check its safety and performance before use on the Fairey Delta 2. The opportunity was also taken to measure the rudder power and the directional stability derivative n_v, of the Venom. The arrangements for streaming and jettisoning the parachute proved safe and satisfactory. The values of the directional stability derivative measured by the parachute method agreed well with values from Dutch roll tests, also made on this aircraft. Author

N64-10161 Aeronautical Research Council (Gt. Brit.)
PRESSURE MEASUREMENTS AT SUPERSONIC SPEEDS ON THREE UNCAMBERED CONICAL WINGS OF UNIT ASPECT RATIO
J. W. Britton London Ministry of Aviation, 1963 51 p refs
(ARC-CP-641; replaces RAE-TN-AERO-2821) HMSO: 7s

Pressure measurements were made at Mach numbers between 1.3 and 2.8 over a range of incidences on three simple models representing thick, conical, uncambered wings with sharp leading edges. These tests form part of an investigation into the effects of thickness and camber on slender wings. The aspect ratio of the models was unity in each case, and the spanwise cross sections were bounded by: (1) rhombi—total leading edge angle = 60°; (2) biconvex circular arcs—total leading edge angle = 60°; (3) biconvex circular arcs—total leading edge angle = 120°. The measured pressure distributions are presented, along with overall lift and drag (excluding skin friction and base drag) obtained by integration. Author

N64-10212 College of Aeronautics, Cranfield (Gt. Brit.)
EXPERIMENTAL INVESTIGATION ON A CROPPED DELTA WING WITH EDGE BLOWING
A. J. Alexander June 1963 42 p refs
(CoA-162)

Low-speed wind-tunnel tests have been made on a 70° cropped delta wing with edge blowing both in the plane of the wing and at a downward deflection angle of 30°. The tests include six-component force and moment measurements, the distribution of static pressure at four chordwise stations, and quantitative measurements of the flow in the leading-edge vortex. At a constant incidence, blowing increases the size and strength of the leading-edge vortices and moves the vortex cores outwards and upwards. Blowing also tends to suppress the secondary separation due to the entrainment of the jet. Blowing from the streamwise tips and trailing edge was relatively ineffective, and most of the tests were made with blowing from the swept leading edges only, with tips and trailing edge sealed. Author

N64-10239 Aeronautical Research Council (Gt. Brit.)
SLENDER NOT-SO-THIN WING THEORY
J. C. Cooke London, HMSO, Jan. 1962 39 p
(ARC-CP-659; replaces RAE-R-AERO-2660; ARC-23791)
HMSO: 7s

A method for making an approximate thickness correction to slender thin-wing theory is presented. The method is tested by applying it to cones with rhombic cross sections, and the agreement is found to be good if the cones are not too thick. It is then suggested that the thickness correction to slender thin-wing theory may be applied unchanged to linear thin-wing theory. This suggestion is compared with some experiments on delta wings, and it is found that there is considerable improvement over thin-wing theory near the center line, but that this improvement is not maintained as the wing tips are approached. Author

N64-10240 Aeronautical Research Council (Gt. Brit.)
TURBULENT BOUNDARY LAYERS ON DELTA WINGS AT ZERO LIFT
J. C. Cooke London, HMSO, Mar. 1963 26 p
(ARC-CP-696; replaces RAE-TN-AERO-2878; ARC-24884)
HMSO: 5s

It is found that, for turbulent flow at Mach number 2 over a thin delta wing at zero lift, the effect of pressure gradient on the boundary layer is negligible; thus boundary-layer calculations allowing for convergence and divergence of streamlines are simplified. When these are done it is found that, except near the center line, where streamline convergence causes extra thickening towards the trailing edge, the momentum thickness is nearly the same as it would be for flow over a flat plate of the same planform. This enables the boundary-layer pressure drag and the skin-friction drag to be determined simply. It is found that the pressure drag may be neglected compared with the total drag, while the skin friction is the same as that of a flat plate of the same planform. Author

N64-10401 Aeronautical Research Council (Gt. Brit.)
AN EMPIRICAL PREDICTION METHOD FOR NON-LINEAR NORMAL FORCE ON THIN WINGS AT SUPERSONIC SPEEDS
J. R. Collingbourne London, Min. of Aviation, 1963 41 p refs
(ARC-CP-662; supersedes RAE-TN-AERO-2809, ARC-23777)
Available from HMSO: 7s 6d

Theoretical and experimental results are used to produce a coherent "engineering" method for predicting normal force on thin, sharp-edged wings at supersonic speeds, the initial

force curve slope being known. The method can be applied at angles up to 90° and, in principle, to any planform, although most of the results used to develop the method are for delta and rectangular wings. A summary of the method is given. Author

N64-10425 Training Center for Experimental Aerodynamics, Rhode-Saint-Genèse (Belgium)
THE AERODYNAMICS OF SAILS
Adrian Millward May 1963 36 p refs Lecture presented to the TCEA May 20, 1963
(TCEA-TM-16)

The aerodynamic and hydrodynamic problems of conventional sails and wingsails are discussed. From the data presented, the following improvements of conventional sails are suggested: (1) the cross-sectional shape should have an arch of approximately 1/13 with the maximum arch at the half chord; (2) the sail should have a uniform angle of incidence to the apparent wind all the way up the mast; (3) the mast should be faired into the sail; (4) full-length battens would be an improvement on the short battens in use at present; (5) an aspect ratio of 6 would be the best compromise for normal weather conditions; (6) the jib should extend as far up the mast as possible to give the full "leading edge slot" effect; and (7) the jib should be able to be traversed sideways into the correct position for the optimum effect on the airflow over the mainsail. It is concluded that a wingsail could be made to work satisfactorily, especially if used on a catamaran or similar boat. A wingsail gives a fine control of thrust and can easily be used to send the boat in reverse. P.V.E.

N64-10468* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
THEORETICAL STUDY OF CAMBER FLUTTER CHARACTERISTICS OF MONOCOQUE AND MULTIWEB WINGS
Robert G. Thomson and Edwin T. Kruszewski Washington, GOP, 1962 23 p refs
(NASA TR R-150) GPO: $0.35

The analysis utilizes a simplified model in which chordwise and spanwise flexibilities of the actual wing are duplicated. This idealized model subjected to a supersonic flow is investigated to predict the flutter behavior and establish a flutter boundary. Additional effects such as aerodynamic damping and variations in cross-sectional curvature are determined and their effect on the predicted flutter boundary is ascertained. A comparison of the predicted flutter boundary with results obtained experimentally for multiweb wing structures shows very good agreement. Author

N64-10539 Grumman Aircraft Engineering Corp., Bethpage, N.Y.
PRESSURE DISTRIBUTIONS AND OIL FILM PHOTOGRAPHS FOR MACH 5 FLOWS PAST FINS MOUNTED ON A FLAT PLATE. PART OF AN INVESTIGATION OF HYPERSONIC FLOW SEPARATION AND CONTROL CHARACTERISTICS
Louis G. Kaufman II Wright-Patterson AFB, Ohio, AF Flight Dynamics Lab., Sept. 1963 45 p refs
(Contract AF 33(616)-8130)
(ASD-TDR-63-755; AD-422031)

Pressure distributions and oil film photographs were obtained for Mach 5 flows past wedge-shaped fins mounted on a sharp leading-edge flat plate. Sharp and blunt leading-edge fins of two different heights were tested for Reynolds numbers, based on the flat-plate length, from 1.1 to 6.6 million. Data were obtained on both the fin and plate surfaces for model angles-of-attack between −5 and +10 degrees. Author

04 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc., and specific types of complete aircraft (e.g., Ground Effects Machines, Flexible Wings, STOL, and VTOL); flight tests; operating problems; safety devices; and stability and control. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 30 Space Vehicles.

N64-10079 General Dynamics/Convair, San Diego, Calif.
LITTLE JOE II MISSION F PERFORMANCE EVALUATION
B. J. Kuchta June 25, 1963 21 p refs
(DC-12-008)

The performance of Little Joe II Mission F was evaluated to determine the effects of thrust variation, wind, thrust misalignments, and launch angle on the Mach-Dynamic Pressure (q) histories. The Mach-q window for Mission F was bounded in Mach number by 0.8 and 1.05 and in q by 570 and 630 psf. Optimum launch angles for the various wind conditions were determined. The optimum launch angle was defined as the launch angle which passes the Mach-q history through the point q = 600 and Mach = 0.9. The performance evaluation was done on a six-degree-of-freedom analog simulation. Graphs of the Mach-q histories are presented for all conditions investigated. The time to enter and the time to leave the window are noted on each curve. R.T.K.

N64-10133 Advisory Group for Aeronautical Research and Development, Paris (France)
GROUND PROXIMITY AND THE VTOL AIRCRAFT
P. E. Colin [1962] 41 p refs
(AGARD Contract 170-61)
(AGARD-409)

The survey includes problems of ground erosion, recirculation, and the aerodynamic pressure distribution on the aircraft in the presence of the ground. The types of VTOL aircraft considered are those using free-propeller or ducted-fan systems or hot-jet lifting engines. Author

N64-10171 Technische Hochschule Darmstadt (W. Germany) Lehrstuhl für Flugtechnik
INFLUENCE OF THE CONTROLLER LOCATION ON THE CONTROL OF AXIAL MOVEMENT OF AN ELASTIC AIRPLANE [EINFLUSS DER REGLERLAGE AUF DIE REGELUNG DER LANGSBEWEGUNG EINES ELASTISCHEN FLUGZEUGS]
W. Lincke [1963] 15 p In GERMAN

The effect, on the control attitude, of the point of insertion of a P-D-control in the elastic fuselage of an aircraft was investigated. In all solutions, considerable deviations from the results obtained by the method of natural oscillation forms were observed. In particular, an appreciable influence of the control constants and the control position on the natural oscillation forms was observed. Also, considerable phase shifting of single fuselage elements against one another was observed. These phase shifts made the determination of the oscillation nodes and internodes impossible. Trans. by I.v.L.

N64-10172 Sikorsky Aircraft Div., United Aircraft Corp., Stratford, Conn.
FUNDAMENTALS OF VTOL-RESEARCH AND SOME PECULIARITIES OF TILT-WINGS AND TILT-PROPELLER AIRPLANES [GRUNDLAGEN DER VTOL-FORSCHUNG UND EINIGE EIGENSCHAFTEN DER KIPPFLUGLER UND KIPPROPELLERFLUGZEUGE]
Philip L. Michel Sept. 1963 22 p In German

The success of producing VTOL aircraft will depend to a very large extent on whether the basic prerequisites and the adopted designs are suited to the performance requirements of a given operation. Therefore, it is essential to precisely define the requirements for vertical flight, the transition, and the maneuverability, in order to evaluate the effect of various necessary compromises on the carrying out of the operational problem. Larger research expenditures are necessary for setting suitable flight characteristic requirements and for the development of suitable techniques for evaluating the suitability of an existing design. A research simulator would enhance the possibility of success in such research. Trans. by I.v.L.

N64-10263 Grumman Aircraft Engineering Corp., Bethpage, N.Y. Engineering Dept.
ON THE ROLE OF MASS-DENSITY RATIO IN CLASSICAL FLUTTER THEORY WITH APPLICATION TO HYDROFOIL FLUTTER PREDICTION
C. E. Squires, Jr. Jan. 15, 1963 62 p ref
(ADR 06-12-62.1)

A well-defined local maximum in flutter speed is seen to occur in the neighborhood of the so-called critical mass-density ratio. It is shown that this maximum point divides the mass-density-ratio range into two subranges which possess distinctly different characteristics with respect to both the physical aspects of classical flutter and the analytical requirements for converged flutter speed predictions. The disadvantages of the traditional modal analysis procedure based on the Theodorsen function representation of unsteadiness (for low-density ratios) are discussed, and alternate analysis techniques are suggested. Author

N64-10267* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PILOTED SIMULATOR STUDY OF THE LOSS OF ALTITUDE BY A JET TRANSPORT IN A GO-AROUND FROM AN INSTRUMENT-LANDING APPROACH
Walter E. Mc Neill Washington, NASA, Nov. 1963 32 p refs
(NASA TN D-2060) OTS: $0.75

A study was made of the effects of providing pilots with indicators combining angle-of-attack and forward acceleration on the performance of go-arounds in a simulated jet transport. Altitude loss was the criterion for go-around performance with various combinations of pilot display, engine thrust available, and altitude at wave-off. The test data indicate that with four-engine thrust available, there was only a minor improvement in go-around performance when the modified angle-of-attack information was presented by means of a null-reading bar indicator. Author

N64-10273 Weapons Research Establishment (Australia)
NOTES ON METHODS OF PARAMETER ESTIMATION IN MISSILE MODELLING USING TRIAL DATA
L. A. Nicholls, P. A. Low, and A. G. Moy Sept. 1963 23 p refs
(Tech. Note SAD-129)

A number of automatic search methods are discussed for use on a digital computer in the estimation of optimum missile-model parameters using results from actual firings. It is concluded that the number and diversity of such optimization tasks may demand an excessive programing effort if each problem is tackled in the manner most economical of computer time. Greater overall economy may then be achieved through the use of general purpose, empirical search methods. Author

N64-10349* National Aeronautics and Space Administration, Washington, D.C.
NASA-FAA SUPERSONIC TRANSPORT STUDY News Release No. 63-252
Nov. 15, 1963 3 p
Available from NASA. Office of Scientific and Technical Information, Washington, D.C.

A series of studies simulating flight profiles of a supersonic transport has been completed. A two-place Navy-A5A jet bomber was used to study possible air traffic control problems and to obtain operational data for planning future supersonic transport flights. The tests showed that because of increased speeds pilots must be given more advanced notice of changes in flight procedures. Inflight weather information was found to be an important factor because changes in outside air temperature and pressure conditions greatly influenced the times and distances required to accelerate from subsonic to Mach 2.0 flight. C.L.W.

N64-10399* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOW-SUBSONIC FLIGHT CHARACTERISTICS OF A MODEL OF A SUPERSONIC-AIRPLANE CONFIGURATION WITH A PARAWING AS A LANDING AID
Joseph L. Johnson, Jr. Washington, NASA, Nov. 1963 53 p refs
(NASA TN D-2031) OTS: $1.50

A wind-tunnel investigation has been conducted at low subsonic speeds to determine the flight characteristics of a model of a supersonic-airplane configuration equipped with a parawing as a landing aid. The model had a 62° delta canard and a 62° delta wing with twin vertical tails located at the 0.27-semispan station. The parawing had a delta planform with a developed area about 60 percent greater than that of the model wing. The results of the investigation showed that the use of a parawing as a landing and takeoff aid appeared to be feasible from the standpoint of stability and control and offered large increases in maximum lift coefficient (which would give substantial reductions in takeoff and landing distances) provided the parawing was positioned high enough above the model to prevent large lift losses due to mutual interference effects. The best overall flight behavior was obtained when the tips of the parawing were attached outboard on the model wing to minimize the relative motion between the model and parawing. Author

N64-10413 American Airlines, Inc., New York, N.Y.
A UNITED STATES SUPERSONIC TRANSPORT
C. R. Smith [1963] 17 p Presented in testimony before The Senate Aviation Subcomm. of the Senate Comm. on Interstate and Foreign Commerce, Washington, Oct. 22, 1963

The feasibility of a United States commercial supersonic transport is discussed. Some reasons given to illustrate the importance of such a development program include the establishment of American technological leadership, increasing our national prestige, increased commercial benefits and the strategic importance of such an aircraft, the savings by the military departments in their research programs, and the lessening of the economic risks taken by aircraft manufacturers. D.E.R.

N64-10436 Civil Aeronautics Board, Washington, D.C. Bureau of Safety
THE PHENOMENON OF AIRCRAFT AQUAPLANING. AIRCRAFT ACCIDENT PREVENTION
Edwin V. Nelmas, Corwin C. Grimes, and Delbert L. Dengis [Oct. 1963] 32 p refs
(BOSP 7-4-2)

Aquaplaning is a condition in which hydrodynamic lift force developed between the tire footprint and the fluid covered runway surface equals or exceeds the vertical reaction of the airplane mass acting on the tire, resulting in the loss of directional stability and braking effectiveness. This phenomenon is the major problem encountered after an aircraft touches down on the runway during adverse weather conditions. It is urged that each air carrier establish a wet runway factor, as well as adverse weather landing techniques, for each type of aircraft operated, utilizing formulas that have already been obtained by research. C.L.W.

N64-10451* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LATERAL-SPREAD SONIC-BOOM GROUND-PRESSURE MEASUREMENTS FROM AIRPLANES AT ALTITUDES TO 75,000 FEET AND AT MACH NUMBERS TO 2.0
David A. Hilton, William L. Copeland, Domenic J. Maglieri and Tony L. Parrott Washington, NASA, Nov. 1963 39 p refs
(NASA TN D-2021) OTS: $1.00

Lift effects were apparent for the bomber airplane for a wide range of altitudes but were noted to be much less significant for the fighter airplanes. For the fighter airplanes, measured values of shock-wave overpressures, wavelength, and positive and negative impulses were in good agreement with calculations based on theory which accounts only for volume effects. For the bomber airplane, however, sizable discrepancies were noted between measurements and volume-theory calculations, and these are believed to be due to associated lift effects. Some significant atmospheric effects were noted with regard to the angles of incidence of the shock waves at ground level and with regard to the shapes of the wave fronts. The measured lateral extent of the ground pressure pattern is in general agreement with calculations based on atmospheric refraction considerations. Author

N64-10481 Joint Publications Research Service, Washington, D.C.
MAJOR CONCLUSIONS OF THE BOOK AEROSYNOPTIC CONDITIONS OF AIRPLANE BUFFETING IN THE UPPER LAYERS OF THE TROPOSPHERE AND LOWER STRATOSPHERE
I. G. Pchelko Feb. 12, 1963 5 p Transl. into ENGLISH of a chapter from a book "Aerosinopticheskiye Uslobiya Boltanki Samoletov v Verkhnikh Sloyakh Troposfery i Nizhney Stratosfere" Moscow 1962 p 89–91
(JPRS-17590; OTS-63-21111) OTS: $0.50

Major conclusions of the book include the following: (1) Buffeting arises not only upon the intersection of high-altitude troughs but, to an even greater degree, at the intersection of high-altitude crests. (2) Buffeting zones are related, in the most intimate way, to jet streams and storm centers. (3) An analysis of buffeting in zones of frontal storm activity, as well as individual cases of storms accompanied by strong cumulonimbus development and significant precipitation, shows that these phenomena are related to those portions of fronts over which lies a pronounced divergence of high-altitude air currents. (4) The wind velocities on the cyclonic side of jet streams, which are characterized by heightened turbulence, have a much greater horizontal inhomogeneity than those on the anticyclonic side and along the jet-stream axis. (5) Conditions favorable to the appearance of buffeting are created mainly by substantial horizontal wind-velocity gradients, i.e., the so-called horizontal wind shifts. I.v.L.

N64-10521* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PHENOMENA OF PNEUMATIC TIRE HYDROPLANING
Walter B. Horne and Robert C. Dreher Washington, NASA, Nov. 1963 54 p refs
(NASA TN D-2056) OTS: $1.50

A physical description of tire hydroplaning is given along with formulas for estimating the ground speed at which it occurs. Eight manifestations of tire hydroplaning which have been experimentally observed are presented and discussed. These manifestations are: detachment of tire footprint, hydrodynamic ground pressure, spin-down of wheel, suppression of tire bow wave, scouring action of escaping fluid in tire-ground footprint region, peaking of fluid displacement drag, loss in braking traction, and loss of tire directional stability. The vehicle, pavement, tire, and fluid parameters of importance to tire hydroplaning are listed and described. Finally, the hazards of tire hydroplaning to ground and air-vehicle-ground performance are listed, and procedures are given to minimize these effects. Author

N64-10609* Martin Co., Baltimore, Md. RIAS Div.
AN APPROACH TO THE IDENTIFICATION AND CONTROL OF LINEAR DYNAMIC SYSTEMS WITH UNKNOWN PARAMETERS
Yu-Chi Ho and B. H. Whalen Repr. from IEEE Trans. Autom. Control, v. AC-8, no. 3, July 1963 2 p refs
(NASA Contract NASr-103; Contract Nonr-1866(16))

An approach to the control of linear dynamic systems with unknown parameters from the viewpoint of (1) criterion for stability (the errors in identification should be bounded or, better yet, be asymptotically decreasing to zero as the amount of information increases) and (2) criterion for realizability (the ability of any scheme to update its control and identification continuously based upon new data received) is examined. The study indicates possible methods for overcoming various types of difficulties in a quantitative and systematic study of "adaptive" control systems. P.V.E.

N64-10611* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
NASA MANNED SPACECRAFT CENTER FACILITIES
Maxime A. Faget Repr. from Proc. of the Third Ann. Symp. on Nondestructive Testing of Aircraft and Missile Components, San Antonio, Feb. 27, 28, Mar. 1, 1962 p 191–198

A brief description of United States' manned spaceflight programs is presented, and the types of facilities planned for the Manned Spacecraft Center in Houston, Texas are discussed. P.V.E.

N64-10661 Joint Publications Research Service, Washington, D.C.
ARTICLES ON ANTI-MISSILE DEFENSE
M. G. Mymrin and Ya. I. Fayenov Nov. 12, 1963 10 p refs Transl. into ENGLISH of two articles from Vestnik Protivovozdushnoy Oborony (Moscow), no. 4 and 8, 1961 p 24–27, 79–80
(JPRS-20101, OTS-63-31244) OTS: $0.50

Modern missile systems designed to combat ICBM's, IRBM's, and shorter range missiles are discussed. The requirements of a system of this type are reviewed along with system design and the methods which are utilized by antimissiles to detect, seek out, and destroy attacking missiles. C.L.W.

05 ASTRONOMY AND ASTROPHYSICS

Includes celestial mechanics; and radioastronomy. *For related information see*: 12 Geophysics, and 29 Space Sciences.

N64-10019 Padua U. (Italy) Astrophysical Observatory
CONTRIBUTIONS OF THE ASTROPHYSICAL OBSERVATORY OF THE UNIVERSITY OF PADUA [CONTRIBUTI DELL' OSSERVATORIO ASTROFISICO, DELL'UNIVERSITA DI PADOVA]
F. Bertola et al 1963 74 p refs In ITALIAN; ENGLISH summaries
(*Its* Contrib. 137-141)

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5. RESEARCH ON VARIABLE NEBULAE. V. NEW VARIABLE IN THE ZONE OF THE ROSETTE NEBULA [RICERCHE SULLE VARIABILI NEBULARI. V. NUOVE VARIABILI NELLA ZONA DELLA ROSETTE NEBULA] P. Maffei p 67–74 refs (See N64-10024 01-05)

N64-10020 Padua U. (Italy) Astrophysical Observatory
A COMPARATIVE SPECTROSCOPIC STUDY OF SOME WOLF-RAYET STARS [STUDIO SPETTROSCOPICO COMPARATIVO DI ALCUNE STELLE DI WOLF-RAYET]
Francesco Bertola Apr. 15, 1963 *In its* Contrib. of the Astrophys. Obs. of the Padua U., 1963 p 3–18 refs In ITALIAN; ENGLISH summary (See N64-10019 01-05)
(*Its* Contrib. 137)

The spectra of twenty-two Wolf-Rayet stars and of seven nuclei of planetary nebulae are discussed comparatively. A revised classification takes into account, in the case of WN stars, two new criteria based on the intensity ratios: N III 4634-4640/N V 4603-4619 and C IV 5801-5812/He I 5875. The relation between line width and spectral type does not appear to exist for WN stars. In addition to types of planetary nuclei already known (WC and WN + C), a nucleus WN is described. Author

N64-10021 Padua U. (Italy) Astrophysical Observatory
THE OPEN CLUSTER NGC 6939
Guido Chincarini Apr. 28, 1963 *In its* Contrib. of the Astrophys. Obs. of the Padua U., 1963 p 19–31 refs In ENGLISH; ITALIAN summary (See N64-10019 01-05)
(*Its* Contrib. 138)

Measurements in the three UBV colors are given for about 300 stars in the field of the galactic cluster NGC 6939. The color-magnitude diagrams show that the cluster is in an advanced evolutionary state. The distance modulus and color excess, determined from the yellow giant stars and the spectral type of one of the stars of the cluster, are respectively $(m - M)_0 = 10.50$ and $E_{B-V} = 0.50$. The cluster is therefore at a distance of 1250 parsecs. It is situated in the Orion spiral arm. Author

N64-10022 Padua U. (Italy) Astrophysical Observatory
THE SPECTRUM OF NOVA HERCULIS 1960 (V 446 HER) [LO SPETTRO DELLA NOVA HERCULIS 1960 (V 446 HER)]
L. Rosino and G. Chincarini June 2, 1963 *In its* Contrib. of the Astrophys. Obs. of the Padua U., 1963 p 33–56 refs In ITALIAN; ENGLISH summary (See N64-10019 01-05)
(*Its* Contrib. 139)

The spectrum of the nova, when first observed at Asiago Astrophysical Laboratory, was characterized by broad emission lines of H, He I, He II, N II, N III, Fe II bordered on the violet by weak absorptions. Nebular and coronal lines of Fe X, Fe VII, O III, N II appeared later, growing rapidly stronger thereafter. The mean velocity of expansion derived by the half-width of the emission bands was ~1200 km/sec. The profiles of emission lines were complex all of the time. The hydrogen lines showed several intensity maxima, which persisted for months. Most of the permitted and forbidden lines had saddle-type structure and some of them were at times completely cut in two. It is assumed that the peculiar structure of the profiles and the splitting in two components of the lines have been the effect of expanding shells, with maximum density in diametrically opposite directions. Wavelengths and identifications of the emission lines measured in the spectra are given. Author

N64-10023 Padua U. (Italy) Astrophysical Observatory
RESEARCH ON VARIABLE NEBULAE. IV. OBSERVATIONS OF VARIABLES AND PECULIAR OBJECTS IN THE ZONE OF 49 ORIONIS [RICERCHE SULLE VARIABILI NEBULARI. IV. OSSERVAZIONI DI VARIABILI ED OGGETTI PECULIARI NELLA ZONA DELLA 49 ORIONIS]
Paolo Maffei June 5, 1963 *In its* Contrib. of the Astrophys. Obs. of the Padua U., 1963 p 57–66 refs In ITALIAN; ENGLISH summary (See N64-10019 01-05)
(*Its* Contrib. 140)

Examination of 22 plates taken with the Asiago reflector in the period October 1961–January 1963, revealed 8 new variable stars. One of these is associated with the 13α Haro object. An infrared nucleus in the 14α object and a small fan nebula (presumably of reflection type) associated with the emission star 249 Haro, have been found by blue-red-infrared comparisons. Author

N64-10024 Padua U. (Italy) Astrophysical Observatory
RESEARCH ON VARIABLE NEBULAE. V. NEW VARIABLE IN THE ZONE OF THE ROSETTE NEBULA [RICERCHE SULLE VARIABILI NEBULARI. V. NUOVE VARIABILI NELLA ZONA DELLA ROSETTE NEBULA]
Paolo Maffei June 5, 1963 *In its* Contrib. of the Astrophys. Obs. of the Padua U., 1963 p 67–74 refs In ITALIAN; ENGLISH summary (See N64-10019 01-05)
(*Its* Contrib. 141)

In the period November 1956–January 1963, some blue and infrared plates were obtained with the 122-cm reflector of Asiago. By examining these plates, 15 new variable stars were found. Their position, amplitude, and absolute magnitude indicate that these variables are likely to be of the RW Aur type. For this reason it is believed that the field contains a T-association. Author

N64-10026 Academy of Sciences of the Armenian SSR, Erevan (USSR) Byurakan Astrophysical Observatory
COMMUNICATIONS OF THE BYURAKAN OBSERVATORY, VOLUME 30
1962 80 p refs In RUSSIAN; ARMENIAN and ENGLISH summaries

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N64-10027 Academy of Sciences of the Armenian SSR, Erevan (USSR) Byurakan Astrophysical Observatory

THE DETAILED COLORIMETRY OF GALAXIES NGC 2976, 3031 (M 81), 3034 (M 82) AND 3077

B. E. Markarian, E. Y. Hovhannisian, and S. N. Arakelian *In its* Communications of the Byurakan Observatory, Vol. 3, 1962 p 3–20 refs In RUSSIAN; ARMENIAN and ENGLISH summaries (See N64-10026 01-05)

The investigation shows that the galaxies NGC 3031, 3034, and 2976, belonging to different color types—become considerably bluer when moving from the center to the outer limits, while the irregular galaxy NGC 3077 becomes redder. Such changes of color can be explained only by the change of composition of the stellar population of galaxies. For instance, according to the obtained results it may be concluded that the integral brightness of the galaxy NGC 3031 is due mainly to the red and yellow stars. The relative role of the yellow stars in the integral brightness of this galaxy gradually increases from its center to the border. The galaxy NGC 3031 is certain to include a sufficient quantity of white stars, but their partial brightness in this galaxy is probably small. The irregular galaxy NGC 3077 has quite another stellar structure. White stars have a significant role in its central part, but the partial brightness of red stars increases from the center to the outer limits. Author

N64-10028 Academy of Sciences of the Armenian SSR, Erevan (USSR) Byurakan Astrophysical Observatory

ABSOLUTE TWO-COLOR PHOTOMETRY OF NGC 7331

A. T. Kalloglian *In its* Communications of the Byurakan Observatory, Vol. 3, 1962 p 21–33 refs In RUSSIAN; ARMENIAN and ENGLISH summaries (See N64-10026 01-05)

The results of two-color absolute photometry of the spiral galaxy NGC 7331 are given. The measurements are carried out with two different diaphragms. The integral magnitude and color index of galaxy are determined on the international scale ($10^{m}.82$ and $+0^{m}.95$, respectively). Author

N64-10029 Academy of Sciences of the Armenian SSR, Erevan (USSR) Byurakan Astrophysical Observatory

THE VARIATION OF THE FLUX DENSITY OF THE RADIO SOURCE CASSIOPEIA-A

V. A. Sanamian and A. M. Asianian *In its* Communications of the Byurakan Observatory, Vol. 3, 1962 p 35–43 refs In RUSSIAN; ARMENIAN and ENGLISH summaries (See N64-10026 01-05)

The precise measurements of the flux density of the radio sources Cassiopeia-A and Cygnus-A at wavelength 4.2 m have been made. The first series of observations was made in 1953, and the second in 1961, with the same radio telescope. The measurements confirm that the ratio of the flux densities of the radio emission of these sources decreased by 13.4 percent during 8 years, that is, an average of 1.7 percent for one year. Since the change of intensity of radio emission of the extragalactic source Cygnus-A is completely excluded for such a short period of time, it is to be assumed that this decrease is conditioned only by the decrease of the flux density of the radio source Cassiopeia-A. Author

N64-10030 Academy of Sciences of the Armenian SSR, Erevan (USSR) Byurakan Astrophysical Observatory

ON THE POLARIZATION OF COMETARY NEBULA NGC 2261

E. E. Khatchikian and N. L. Kalloglian *In its* Communications of the Byurakan Observatory, Vol. 3, 1962 p 45–50 refs In RUSSIAN; ARMENIAN and ENGLISH summaries (See N64-10026 01-05)

A polarimetric investigation based on three series of photographic observations of NGC 2261 has been made. The observations confirm a previous conclusion that the nebula is radially polarized. The mean degree of polarization is 18% for the first two series, and 16% for the third. A new bright filament is noticeable in the east side of the nebula, which stretches to the north and is also polarized. Although the nebula is variable, no strong change of polarization is noticeable. Author

N64-10031 Academy of Sciences of the Armenian SSR, Erevan (USSR) Byurakan Astrophysical Observatory

THE COLORIMETRY OF COMETARY NEBULA NGC 2261

E. S. Parsamian *In its* Communications of the Byurakan Observatory, Vol. 3, 1962 p 51–65 refs In RUSSIAN; ARMENIAN and ENGLISH summaries (See N64-10026 01-05)

B to V and U to B color indices have been determined for the whole nebula as well as for its different points. The spectral distribution curve of nebular radiation is based on three colors. The distribution of intensity in the nebula reveals its structural nonhomogeneity and proves that distribution in the U, B, and V to be similar. The dependence of the NGC 2261 color indices on brightness has been compared with that of NGC 7023 (dusty) and IC 432 (gaseous) nebula. In three different cases, there are three different spectral distributions, proving that all three nebulae are of different natures. Hubbles relation for NGC 2261 nebula is shown to be violated. Author

N64-10032 Academy of Sciences of the Armenian SSR, Erevan (USSR) Byurakan Astrophysical Observatory

POLARISATION OF THE β CORONA BOREALIS

R. A. Vardanian *In its* Communications of the Byurakan Observatory, Vol. 3, 1962 p 67–76 refs In RUSSIAN; ARMENIAN and ENGLISH summaries (See N64-10026 01-05)

The results of polarimetric observations of the star β CrB are as follows: (1) the degree of polarization of the β CrB changes from 0.0 to 2.0 percent, and the position angle of the polarization varies from −10 to 60 degrees; (2) when the position angle deviates from 28 degrees, the percentage of the polarization decreases; (3) the mean percentages of polarization are different for various wave lengths; and (4) the variations of the parameters of polarization of β CrB probably are determined by the star. Author

N64-10321 Republic Observatory, Johannesburg (Republic of South Africa)

CIRCULARS, VOLUME 7, NUMBER 122, 1963

Pretoria, The Gov't. Printer, 1963 26 p

Observations at the Johannesburg observatory of the following are presented: (1) photographic observations of minor planets, (2) photographic observations of comets, (3) photoelectric observations of the eclipsing binary R Canis Majoris, (4) micrometer measures of double stars, (5) interferometer measures of double stars, (6) the orbit of β 1000 AB, C, (7) the orbit of B 52, (8) the orbit of I 65, (9) the orbit of 0Σ 177, ADS 6276, and (10) the orbit of B 1606. P.V.E.

N64-10469* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OBSERVATIONAL ASTROPHYSICS FROM ROCKETS. STELLAR SPECTRA

Theodore P. Stecher and James E. Milligan Repr. from Space III Amsterdam, North-Holland Publ., 1963 p 1061-1067 refs Proc. of the 3rd Intern. Space Sci. Symp., Washington, Apr. 30-May 9, 1962 Previously announced as NASA TM X-50021 See N63-16707 14-28)

(NASA RP-71)

Instrumentation was flown in an Aerobee rocket to obtain stellar spectra in the ultraviolet and encountered a bright UV aurora with no visible counterpart. The radiation which occurred in the 1300 and 1800 Å region had a strong North-South asymmetry but was geometrically quiescent. Although this background radiation limited the number of stellar spectra to a fraction of what had been expected, satisfactory spectra were obtained between 1600 Å and 4000 Å for 10 stars. The spectral types ranged from Fola to O_5f and WC_7. Satisfactory agreement between theoretical model atmospheres and the observations was obtained only for the Fola star. For the hotter stars a fundamental disagreement occurs at wavelengths below λ2400 resulting in a discrepancy of a factor of ten or more at λ2000. Author

N64-10498 Joint Publications Research Service, Washington, D.C.

RADAR PROBES OF THE PLANET MERCURY

V. A. Kotel'nikov, et al Mar. 19, 1963 8 p refs Transl. into ENGLISH from Koklady Akad. Nauk SSSR (Moscow), v. 147, no. 6, Dec. 21, 1962 p 1320-1323

(JPRS-18211; OTS-63-21357) OTS: $0.50

In June 1962, the U.S.S.R. carried out a radar survey of the planet Mercury. The measurements were made at Mercury's perigee. The distance to Mercury during the measurements was 83 to 88 million km, twice that of the radar survey of Venus in 1961. The materials obtained in 53 sessions, over the period from 10 through 15 June 1962, were treated. The average spectrum of signals reflected by Mercury during that period, the distribution of probabilities for values of the reflection coefficient with respect to energy in the 4-cycle and 12-cycle frequency bands, and the accumulation of difference energy for various values of the astronomical unit are presented. Statistical analysis of the data indicates that the correctness of the astronomical unit cannot be guaranteed. However, the results of the completed radar observations of Mercury do confirm the value of the astronomical unit obtained in the Venus survey in 1961, and yield a coefficient of reflection for Mercury which is close to that of the lunar surface. R.T.K.

N64-10563 Joint Publications Research Service, Washington, D.C.

RESEARCH ON THE DIRECTIONAL SCATTERING OF UHF RADIO SIGNALS BY METEOR TRAILS

V. F. Chepura, B. L. Kashcheyev, and B. G. Bondar Feb. 11, 1963 13 p refs Transl. into ENGLISH of an article from Elektrosvyaz (Moscow), v. 16, no. 11, Nov. 1962 p 3-10

(JPRS-17555; OTS-63-21089) OTS: $0.50

Results are given of an experimental study of UHF scattering by meteor trails. Data have been obtained on the variation in the correlation factor of two signals of nearly the same frequency received simultaneously at the same location. During the experiment one of the transmitters was fixed, while the other was moved to various sites. An examination is made of the dependence of the correlation factor on the level at which the signal durations and reflection coincidence times are measured, as well as on the duration of the signal. Author

N64-10653 Joint Publications Research Service, Washington, D.C.

NEUTRINO ASTRONOMY

Gyorgy Marx Apr. 9, 1963 19 p refs Transl. into ENGLISH of an article from Fiz. Szemle (Budapest), v. 13, no. 1, Jan. 1963 p 13-20

(JPRS-18605; OTS-63-21534) OTS: $0.50

Characteristics of neutrinos and their relationship to astronomy are discussed. Neutrinos originating in radioactive decay irradiate in space in a manner similar to light; their velocity is also equal to that of light. The intensity of neutrino radiation has been found to supersede every radiation reaching earth with the exception of light; however, its great penetration power (over a billion times that of light) makes its detection difficult. The sun is the strongest natural neutrino source known. With advancements in instrumentation for neutrino detection, investigation of the sun could yield important astrophysical data. Results of past investigations indicate that the chief obstacle to raising the sensitivity of existing instruments is the high threshold energy of the detecting reactions in use. R.T.K.

N64-10653 Joint Publications Research Service, Washington, D.C.

SOVIET CATALOGING OF FAINT STARS IN THE SOUTHERN HEMISPHERE

M. S. Zverev May 17, 1963 8 p Transl. into ENGLISH of an article from Vestnik Akad. Nauk SSSR (Moscow), v. 33, no. 2, Feb. 1963 p 88-91

(JPRS-19262; OTS-63-21848) OTS: $0.50

The efforts of the U.S.S.R. to establish observatories in the southern hemisphere, in order that a catalog containing a sufficient number of stars (of the order of 20,000) evenly distributed throughout the whole sky can be compiled, are described. P.V.E.

06 AUXILIARY SYSTEMS

Includes fuel cells and solar cells; gas turbines; hydraulic, pneumatic and electrical control systems and actuators; and inverters. *For primary propulsion systems see*: 27 Propulsion. *For related information see*: 08 Communications; 09 Electronics; 10 Facilities, Research and Support; 15 Instrumentation and Photography; and 22 Navigation and Guidance.

N64-10085* General Motors Corp., Indianapolis, Ind. Allison Div.
DEVELOPMENT AND TEST OF ELECTROLYTE MATRIX COMBINATIONS FOR MERCURY-POTASSIUM FUEL CELL Third Quarterly Technical Progress Report, June 12-Sept. 12, 1963
T. F. Nagey Oct. 10, 1963 17 p
(NASA Contract NASw-476)
(NASA CR-52141; EDR-3609) OTS: $1.60 ph, $0.80 mf

Development and testing of electrolyte matrix combinations for mercury-potassium fuel cells are discussed. Work with fine MgO powder led to improvement of the KOH-KBr-KI eutectic-MgO composite. Two changes were: (1) the use of a new packed-baking process, and (2) the use of a new grade of MgO. Results of six small cell tests showed that the matrix cracked at some stage of operation. The sixth test gave over 12 hours of performance under a limited operating condition. P.V.E.

N64-10098* Northrop Corp., Hawthorne, Calif.
TECHNICAL DESCRIPTION AND OPERATING INSTRUCTIONS FOR NASA FLOW-DIRECTION AND PITOT-PRESSURE SENSOR
[1963] 83 p refs
(NASA Contracts NAI-3200 and NAS4-82)
(NASA CR-52286; NORT 60-46) OTS: $8.10 ph, $2.69 mf

Technical information pertaining to the operation of the NASA flow-direction and pitot-pressure sensor is presented. Included in this information are a technical description of the sensor, special assembly instructions, operating characteristics, wiring diagrams, and parts list. I.v.L.

N64-10101* Electro-Optical Systems, Inc., Pasadena, Calif.
SOLAR ENERGY THERMIONIC CONVERSION SYSTEM Summary of Final Report, 22 May-22 Nov. 1961
W. R. Menetrey Jan. 15, 1962 38 p refs
(NASA Contract NAS7-100; JPL Contract 950109)
(NASA CR-52269; EOS-1850-Summary) OTS: $3.60 ph, $1.34 mf

Progress reported includes the following: (1) Two final concentrators, JM-1 and JM-1-2, for the solar-energy thermionic-conversion system (SET) were fabricated. Each concentrator met or exceeded the mirror efficiency goal when used with a cavity of one-half-inch entrance diameter. (2) A total of 22 diodes of the SET configuration have been fabricated. Ten of these have been electrically tested. While the basic diode configuration has remained the same, several modifications in materials and dimensions have occurred. (3) The generator support system has been assembled and tested for erection characteristics. Tests, which consisted of releasing the actuation mechanism and allowing the generator to be brought into position and locked into place, demonstrated that the basic design functioned as expected. (4) The preliminary analysis of the flux-control system has been almost completed, including the dimensions of the bimetallic elements, anticipated temperatures, and bimetallic displacements. (5) Several supporting efforts were undertaken related to the fabrication, assembly, and test of the thermionic generator. Also, a description of the solar test facility is presented. I.v.L.

N64-10111* Monsanto Research Corp., Dayton, Ohio
DEVELOPMENT OF IMPROVED SINGLE CRYSTAL GALLIUM PHOSPHIDE SOLAR CELLS Quarterly Report No. 1, 12 June-12 Sept. 1963
W. O. Groves and A. S. Epstein [1963] 52 p refs
(NASA Contract NAS3-2776)
(NASA CR-52140) OTS: $5.60 ph, $1.76 mf

Single-crystal gallium phosphide was prepared by epitaxial deposition on single-crystal gallium arsenide using hydrogen chloride in an open-tube vapor transport process with either gallium phosphide or gallium plus phosphorus sources. Good epitaxial interfaces were achieved by pretreating the substrate with hydrogen and phosphorus at high temperatures. Zinc diffusion profiles in the gallium phosphide were not planar because of structural imperfections in the material, and the P-N junctions exhibited large leakage. In measurements of solar-cell characteristics, photocells gave open circuit voltages up to 0.8 volt and short-circuit currents up to 0.2 ma/cm^2. The low collection efficiency may be attributed to short minority carrier lifetime. Author

N64-10181 Federal Aviation Agency, Washington, D.C.
NAS CHART OVERLAYS FOR THE SYSTEM DESIGN TEAM
Harry L. Lamb July 1963 204 p refs

This report presents reproductions of 20 of 35 overlays being made for the System Design Team to describe the Air Traffic Control System. In addition to the reproductions, the report contains a descriptive background, and data and sources from which the overlays are prepared. Author

N64-10211 Mallinckrodt Chemical Works, Weldon Spring, Mo.
METHODS FOR TAPPING MOLTEN URANIUM FROM AN ELECTROLYTIC CELL Topical Report
R. D. Piper, J. D. Vie, J. N. Reyland, R. J. Kornfield, and D. E. Treadway Nov. 15, 1963 19 p refs
(MCW-1481) OTS: $0.50

Methods of tapping molten uranium from an electrolytic cell in which it is formed and transferring the molten metal to ingot molds have been tested in the laboratory and pilot-plant. Two methods appear suitable: a stopper rod and weir system using a UO_2-impregnated graphite stopper rod, and a vacuum-withdrawal system using a heated graphite pipe to carry the molten uranium to an evacuated mold chamber. The vacuum-withdrawal system is superior and will be used in a prototype electrolytic cell. Author

N64-10442* Union Carbide Corp., Parma, Ohio Research Lab.
STUDY PROGRAM TO IMPROVE FUEL CELL PERFORMANCE BY PULSING TECHNIQUES 1st Quarterly Report, July 1-Sept. 30, 1963
M. L. Kronenberg Oct. 1, 1963 21 p
(NASA Contract NAS3-2752)
(NASA CR-52490) OTS: $2.60 ph, $0.83 mf

Equipment was designed and constructed to provide electrolyte and gas pulsing in the subsonic range (0 to 425 cpm) at controlled amplitudes. Preliminary experiments on electrolyte pulsing using wetproofed carbon electrodes showed cell voltage fluctuations of approximately 60 mv at a pressure amplitude of 12 psig at moderate current densities. The voltage amplitude was independent of frequency over the range 55 to 220 cpm. Data obtained thus far indicate that there is no significant polarization difference between 1/4 in. electrodes operating on continuous dc and those operating on 60-cycle interrupted dc. Author

N64-10452* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
FEASIBILITY STUDY OF A BANG-BANG PATH CONTROL FOR A REENTRY VEHICLE
Jack A. White Washington, NASA, Nov. 1963 36 p refs
(NASA TN D-2049) OTS: $1.00

A study of a bang-bang controller for range control of a direct descent reentry has been made. The path trajectory selected for the study was a dive into the atmosphere followed by a constant-altitude phase and a constant-lift-coefficient glide. This trajectory allows a closed-form solution of desired altitude as a function of desired range. An analytical equation which represents the switching curve for the bang-bang controller is developed and evaluated. Results of this study show that the switching curve used for the bang-bang controller gives an excellent prediction of when a control maneuver should be made to achieve rapidly level flight conditions at the desired altitude. The results also show that the equation representing the switching curve was effective for both high-drag–low-lift reentry vehicles and high-lift reentry vehicles, and for a wide range of reentry conditions. Author

N64-10488 Joint Publications Research Service, Washington, D.C.
STATISTICAL THEORY OF CONTINUOUS SELF-ADJUSTING SYSTEMS
I. Ye. Kazakov Feb. 26, 1963 15 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, OTN, Energ. i Avtomat. (Moscow), no. 6, 1962 p 76–81
(JPRS-17820; OTS-63-21207) OTS: $0.50

A method for determining the gradient of the degree of quality control by making use of auxiliary operator is presented. The method requires knowledge of the structure of the operators of the object and the control system. The auxiliary operators are unequivocally determined through the operators of the object and the control system, and depend on their parameters. The parameters of the auxiliary operator might be established arbitrarily in a sufficiently broad range without any considerable change in the dynamics and precision of the adjustment of correcting circuits. The analysis of this possibility in self-adjusting systems of continuous type for random signals in action is presented as follows: (1) equations and structure of the self-adjusting system, and (2) quasi-stationary operating conditions of the external adjustment of the parameters.
R.T.K.

N64-10548 Calvin Coll., Grand Rapids, Mich.
SILVER MIGRATION AND TRANSPORT MECHANISM STUDIES IN SILVER OXIDE-ZINC BATTERIES [Final Report]
T. P. Dirkse Wright-Patterson AFB, Ohio, AF Aero-Propulsion Lab., Sept. 1963 55 p refs
(Contract AF 33(657)-8689)
(ASD-TDR-63-863; AD-421049)

A study has been made of the methods by which silver is transported from the silver electrodes in silver-alkaline batteries. This study has been made using radioactive silver tracers as well as by straight analytical techniques. The transport is due primarily to diffusion. Various kinds of separator materials have been tested with respect to reactivity with dissolved silver oxides, as well as with respect to effectiveness in preventing the transport of silver in a working silver-alkaline battery. Generally, effectiveness in preventing transport is due to reaction with the silver oxide dissolved in the potassium hydroxide electrolyte. Author

N64-10630 Joint Publications Research Service, Washington, D.C.
AUTOMATIC CONTROL OF NONSTATIONARY PARAMETERS AND PARAMETRIC FIELDS
G. P. Katys Feb. 18, 1963 750 p refs Transl. into ENGLISH of a book "Avtomaticheskiy Kontrol' Nostasionarnykh Parametron i Parametricheskikh Poley", Moscow, 1962 p 1–472
(JPRS-17695; OTS-63-21154) OTS: $8.00

Topics discussed are: (1) automatic monitoring of nonstationary fields; (2) theoretical problems in the passive scanning of nonstationary fields; (3) investigation of integral-time characteristics of scanning trajectories; (4) experimental determination of characteristics of trajectories; (5) determination of the optical scanning trajectory as a function of the properties of the field; and (6) experimental determination of optimal scanning trajectory. A section of conclusions is included. J.E.T.

07 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy); chemical engineering; chemical properties of materials; and synthesis. *For related information see*: 18 Materials, Metallic; 19 Materials, Nonmetallic; and 26 Propellants and Combustion.

N64-10116 Joint Publications Research Service, Washington, D.C.
PREPARATION AND ELECTROPHYSICAL PROPERTIES OF SOME POLY-SCHIFF BASES, USSR
B. E. Davydov, B. A. Krentsel', Yu. A. Popov, and L. V. Prokof'yeva Oct. 23, 1963 7 p refs Transl. into ENGLISH of an article from Vysokomolekul. Soedin. (USSR), v. 5, no. 3, 1963
(JPRS-21573; OTS-63-31992) OTS: $0.50

Polymers with a system of conjugate bonds in the basic chain have been found to possess interesting electrophysical and semiconductor properties, especially if the conjugate system is $-C{=}C-$ and $-C{=}N-$. For the study of this type of polymer, the polycondensation of glyoxal with p-phenylenediamine (PPDA), and the polycondensation of PPDA with terephthalic aldehyde have been caused to occur in acetic acid and boiling benzene, respectively. The conclusions are: (1) previously undescribed poly-Schiff bases with conjugate bonds and a heteroatom in the basic chain have been obtained, (2) it has been found that the temperature dependence of the electrical conductivity of these polymers obeys the law, sigma = sigma sub zero e-delta e/2kT. D.E.R.

N64-10189 Rochester U., N.Y. Div. of Radiation Chemistry and Toxicology
FACTORS CONTROLLING CALCIFICATION
D. R. Taves and W. F. Neuman Oct. 31, 1963 136 p refs
(Contract W-7401-eng-49)
(UR-628)

A model system was used to study the formation of calcium phosphate crystals in solutions physiological in respect to temperature, pH, ionic strength, and calcium phosphate concentrations. The type of nucleation, the calcium phosphate ratio of the solution, and the concentration of fluoride and magnesium were studied as independent variables. The interaction of these variables was such that under physiological conditions, nucleation by an extracted tendon preparation was superior to either spontaneous precipitation or isolated calcium phosphate crystals. The biological implications are discussed. Author

N64-10318 Los Alamos Scientific Lab., N. Mex.
THE APPLICATION OF AUTOMATIC COMPUTATIONAL TECHNIQUES TO THE ANALYSIS OF ULTRACENTRIFUGAL SEDIMENTATION-VELOCITY MOLECULAR WEIGHT DATA FOR DEOXYRIBONUCLEIC ACID

G. R. Shepherd, P. N. Dean, and B. J. Noland Oct. 31, 1961 39 p refs
(Contract W-7405-eng-36)
(LA-2964) OTS: $1.00

A FORTRAN computer program has been devised for the calculation of deoxyribonucleic acid molecular weights from viscosity and ultracentrifugal sedimentation velocity data. The process of data entry has been simplified by the use of special loading forms and through provisions for the entry of data in the form in which it is obtained in the laboratory. Routine use of this program has increased the reliability of computed results and freed skilled operators from the necessity of performing laborious hand calculations. Author

N64-10319 International Union of Pure and Applied Chemistry, Basle (Switzerland) Commission on High Temperatures and Refractories
BIBLIOGRAPHY ON THE HIGH TEMPERATURE CHEMISTRY AND PHYSICS OF GASES AND GAS-CONDENSED PHASE REACTIONS, NO. 9
L. Brewer, comp. (Calif. U., Berkeley) Sept. 30, 1963 16 p

A bibliography of current research papers and reports on the reactions between gases and condensed phases and the spectroscopy of interest to high-temperature chemistry research (thermochemistry) is given. The papers included cite several references on the thermodynamic and mechanical properties of metals, refractory materials, and their alloys. D.E.R.

N64-10344* Florida State U., Tallahassee
THE SYNTHESIS OF α-L-ASPARTYL-L-SERYLGLYCINE
Sidney W. Fox, Tadao Hayakawa, and Kaoru Harada Repr. from Bull. Chem. Soc. Japan (Tokyo), v. 36, no. 8, 1963 p 1050–1051 refs
(NASA Grant NsG-173-62)

A method for synthesis of α-L-aspartyl-L-serylglycine is described which depends solely upon benzyl or carbobenzyloxy substituents which are entirely removable by hydrogenolysis. This route accordingly avoids any alkaline derivatization. P.V.E.

N64-10363* Jet Propulsion Lab. Calif. Inst. of Tech., Pasadena
ALKOXYCHLOROSILANES AND ALKOXYSILANES CONTAINING SILANE HYDROGEN
Olgierd J. Klejnot Repr. from Inorg. Chem., v. 2, no. 4, Aug. 1963 p 825–828 Presented at the 17th Intern. Congr. of Pure and Appl. Chem., Munich, Sept., 1959
(NASA Contract NAS7-100)
(NASA CR-52483; JPL-TR-32-220)

Syntheses and new compounds are reported for silanes $SiHCl_{3-x}(OR)_x$ and $SiH_{4-x}(OR)_x$ with $x=1-3$, $R=CH_3, C_2H_5$. New silanes $CH_3SiHClOR$ and CH_3SiH_2OR are reported. Ligand exchanges of such silanes are described. Properties of some alkoxides of carbon and silicon are compared on the basis of new data. Author

N64-10364 Atomics International, Canoga Park, Calif.
CALCULATION OF HEATS OF VAPORIZATION AND FUSION OF NONIONIC LIQUIDS FROM THE RIGID SPHERE EQUATION OF STATE
S. J. Yosim and B. B. Owens Oct. 31, 1963 15 p refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-8879) OTS: $0.50

The heats of vaporization of the rare gases, diatomic and polyatomic molecules, were calculated from the isothermal reversible work required to compress a fluid of rigid spheres from the volume it occupies at a pressure of one atmosphere to the volume of the corresponding liquid. Similarly, the heats of fusion of the rare gases were calculated from the additional work necessary to compress the rigid sphere fluid from the volume of the liquid to that of the solid. Agreement between the calculated and observed values was with few exceptions very good. Author

N64-10394 Argonne National Lab., Ill.
DENSITY MEASUREMENTS IN GLOVEBOXES; WITH DENSITY DATA ON MONOBROMOBENZENE, CAST THORIUM, THORIUM-URANIUM, AND THORIUM-PLUTONIUM ALLOYS
B. Blumenthal Sept. 1963 31 p refs
(AEC Contract W-31-109-eng-38)
(ANL-6671)

A method for the determination of density of plutonium-containing materials while working in gloveboxes is reported. The measurements were part of an investigation of the constitution and properties of the thorium–uranium–plutonium alloys. The densities of two series of arc-melted thorium alloys were measured. The first series was prepared from a commercial grade of thorium and dingot uranium. The second series was prepared from crystal bar thorium and high-purity plutonium. By taking into consideration temperature differences between glovebox atmosphere and the liquid, it was possible to make density measurements in gloveboxes by the hydrostatic weighing method with monobromobenzene as a liquid with an accuracy of ± 0.05 g/cm^3. This accuracy allowed the detection of structural changes in thorium–uranium and thorium–plutonium alloys. R.T.K.

N64-10395 Argonne National Lab., Ill.
CHEMICAL ENGINEERING DIVISION SUMMARY REPORT, JANUARY, FEBRUARY, MARCH 1963
S. Lawroski [1963] 206 p refs
(AEC Contract W-31-109-eng-38)
(ANL-6687)

The following areas of investigation are discussed: (1) chemical-metallurgical processing, (2) fuel cycle applications of volatility and fluidization techniques, (3) calorimetry, (4) reactor safety, (5) energy conversion, and (6) routine operations. R.T.K.

N64-10431 Mallinckrodt Chemical Works, Weldon Spring, Mo. Uranium Div.
CONTINUOUS STREAM ANALYSIS OF URANIUM SOLUTIONS OF X-RAY FLUORESCENCE Topical Report
W. C. Stoecker Nov. 15, 1963 17 p refs
(Contract W-14-108-eng-8)
(MCW-1477) OTS: $0.50

The apparatus consisted of a standard X-ray spectrograph, a suitable flow cell constructed of Plexiglas, a mixing reservoir, and a pump. Changes in concentration of uranium were measured by continuous chart recordings of the uranium La total peak intensity. At a flow rate through the cell of 600 ml/min, changes in uranium concentration in the reservoir were recorded on the chart in about 20 seconds. Experiments showed that peak-to-background ratios could be used to provide an accurate measure of concentration changes independently of instrumental and other variables. Continuous analysis was also found to be applicable to the determination of total uranium in raffinate slurries where some of the uranium is present in the suspended solids. Author

N64-10491 Joint Publications Research Service, Washington, D.C.
PROBLEMS IN KINETICS AND CATALYSIS

Mar. 5, 1963 51 p refs Transl. into ENGLISH of two articles from Kinetika i Kataliz (Moscow), v. 3, no. 5, Sept.–Oct. 1962 p 627–642
(JPRS-17-941; OTS-63-21244) OTS: $1.25

CONTENTS:

1. SOME PROBLEMS IN CONTEMPORARY CHEMICAL KINETICS V. V. Voyevodskiy p 1–19
2. SOME PROBLEMS IN HETEROGENEOUS CATALYSIS G. K. Boreskov p 20–48

N64-10512 Joint Publications Research Service, Washington, D.C.

RESULTS IN THE PREPARATION OF CLOSED RADIOACTIVE RADIATION SOURCES IN HUNGARY

George Cserep and Vilmos Stenger July 11, 1963 8 p refs Transl. into ENGLISH from Energia Atomtech. (Budapest), v. 16, no. 3, Mar. 1963 p 142–143
(JPRS-20129; OTS-63-31261) OTS: $0.50

The following closed sources of gamma radiation are discussed: (1) radioactive cobalt, (2) radioactive zinc, (3) radioactive cesium, and (4) radioactive iridium. The advantage of the iridium radiation source was that the metal iridium was found to be resistant to both an acid and alkaline atmosphere. R.T.K.

N64-10518 Joint Publications Research Service, Washington, D.C.

RESONANCE THEORY OF CHEMICAL REACTION RATES

A. M. Brodskiy and A. Ya. Temkin Nov. 18, 1963 8 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (Moscow), v. 152, no. 1, Sept. 1, 1963 p 127–130
(JPRS-21897; OTS-63-41153) OTS: $0.50

A resonance theory of chemical reaction rates is presented. This theory proposes that the amplitude of scattering and the cross section of the reactions looked at are determined, in some cases, mainly by the resonance member, and are described by the Breyt–Wigner formula. This suggestion also pertains to some other inelastic bimolecular processes. In order to confirm this proposal, several general concepts from the modern theory of scattering and nuclear reactions based on a study of the analytical properties of scattering amplitude were used. It is felt that the reasoning presented can prove useful for low energies when the method of equilibrium complex is valid. R.T.K.

N64-10552 Cornell U., Ithaca, N.Y.

AN INVESTIGATION OF THE ELECTRO-OXIDATION OF THE 1,2'-BIS(DIPHENYL) – BORATE ION Technical Report

Ted Mc Kinney and David H. Geske [1963] 88 p refs
(AROD-2814:3; AD-421702)

The electro-oxidation of the 1,2'-bis(diphenyl) borate ion (BDP^-) was investigated by means of voltammetry, coulometry, chronopotentiometry, and various absorption spectroscopic techniques. Results are: (1) Conclusive evidence was presented of the validity of the following reaction scheme:

$$BDP^- - 2e^- \xrightarrow{p} BDPox^+ \quad (1)$$

$$BDPox^+ + \text{solvent} \xrightarrow{k_3} \text{product} + H^+ \quad (2)$$

$$BDP^- + H^+ \rightarrow HBDP. \quad (3)$$

(2) The ultraviolet spectra presented excellent evidence that the product of reaction (3) is 2-biphenyl-(2,2'-diphenyl) boron. (3) The absence of the fluorene chromophore in buffered electrolysis solutions is interpreted as resulting from cleavage of both 9-borafluorenyl groups in BDP^- when it undergoes electro-oxidation. Also, a reaction representing the primary electrode process is presented. I.v.L.

N64-10572 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON BIOCHEMISTRY

I. K. Kolomiytseva, L. P. Kayuskin, A. M. Kuzin, V. Ye. Kholmogorov, A. I. Sidorov et al Mar. 19, 1963 12 p refs Transl. into ENGLISH of two articles from Doklay Akad. Nauk SSSR, (Moscow), v. 147, no. 4, 1962 p 951–953, 954–957
(JPRS-18213; OTS-63-21359) OTS: $0.50

Research into the measurement of the free radical concentration in rat liver lipids, and a comparison of the results obtained with data on lipid-metabolism disturbances during various periods following irradiation are discussed along with an article on an investigation into light-induced electron paramagnetic resonance (EPR) signals in and the infrared spectra of crystalline chlorophyll. P.V.E.

N64-10581 Joint Publications Research Service, Washington, D.C.

NEWS IN RADIATION POLYMERIZATION

I. M. Barkalov and V. I. Gol'danskiy Apr. 24, 1963 21 p refs Transl. into ENGLISH from Khim. Prom. (Leningrad), no. 12, 1962 p 1–5
(JPRS-18868; OTS-63-21657) OTS: $0.50

A review is presented of development in radiation polymerization, including ionic polymerization and polymerization in the solid phase. P.V.E.

N64-10582 Joint Publications Research Service, Washington, D.C.

MOLECULAR SPECTROSCOPY

M. M. Sushchinskiy May 7, 1963 15 p refs Transl. into ENGLISH from Vestnik Akad. Nauk SSSR (Moscow), v. 32, no. 10, Oct. 1962 p 36–45
(JPRS-19072; OTS-63-21760) OTS: $0.50

The science of molecular spectroscopy occupies a unique position between physics and chemistry. In its methods of experimental and theoretical research and in its very character of approaching problems, molecular spectroscopy remains a field of physics, but since the object of investigation is the molecule, the results obtained are of greatest interest for chemistry. Establishing the symmetry of a molecule from its oscillatory spectra is based on very general ratios deriving from group theory. The generality of the method is its chief merit. Oscillatory spectra, in spite of the complexity and uniqueness of their regularities, constitute rich material for conclusions of molecular structure, and in many cases allow establishment of the whole structure. Molecular spectral analysis is especially important in continuous control and automatic regulation of production processes. P.V.E.

N64-10631 Joint Publications Research Service, Washington, D.C.

THE USE OF CORROSION INHIBITORS TO PROTECT THE INSIDE SURFACES OF TANKS IN OIL TANKERS

M. Karepina and B. Sushkov Feb. 19, 1963 14 p Transl. into ENGLISH from Morsk. Flot (Moscow), v. 18, no. 12, 1957 p 15–16
(JPRS-17719; OTS-63-21169) OTS: $0.50

Substances which dissolve poorly in oil products and well in water are used as inhibitors. The basic data on investigations of the corrosion inhibitor, compound AMBA, are presented. The compound is made of ammonia and benzoic acid. Studies of its protective action on metal were conducted in various sulfurous oil products. Samples of all the basic kinds of shipbuilding steels and one kind of brass were tested.

The actual tests of the corrosion inhibitor, conducted on stationary containers and on an oil tanker ship, demonstrated the high effectiveness of protection of various samples of steel used in shipbuilding. With the addition of the inhibitor, the corrosion was completely stopped or slowed. Therefore, the use of inhibitors is felt to have great significance for the protection of tankers, piping and stationary containers, especially when they carry or hold sulfurous oil and light grades of sulfurous oil products. R.T.K.

N64-10655 Joint Publications Research Service, Washington, D.C.
ON THE PROBLEMS OF PHASE TRANSFORMATIONS IN THE REDUCTION OF U_4O_9
V. M. Zhukovskiy, Ye. V. Tkachenko, and V. G. Vlasov May 22, 1963 9 p refs Transl. into ENGLISH of an article from Fiz. Metal. i Metalloved. (Sverdlovsk), v. 15, no. 2, 1963 p 210-214
(JPRS-19324; OTS 63-21879) OTS: $0.50

Direct reduction was conducted with solid carbon and indirect reduction was conducted with decomposed ammonia. The following scheme of phase transformations during the reduction processes can be given on the basis of the results of X-ray diffraction studies: $U_4O_9 \rightarrow UO_{2+x_{max}} \rightarrow UO_{2+x}$. X-ray diffraction studies of the intermediate and final reduction products of U_4O_9 with solid carbon and decomposed ammonia showed that in both cases as the degree of reduction increased, the intensity of the U_4O_9 lines decreased, while the lines of the phase $UO_{2+x_{max}}$ became brighter and brighter. This occurred when the summary compositions of the solid phases changed from $UO_{2.23}$ to $UO_{2+x_{max}}$, where $0.18>x_{max}>0.1$ for direct reduction and $0.10>x_{max}>0.06$ for indirect reduction. Thus at this stage of the reduction, there was always a mixture of the two phases U_4O_9 and $UO_{2+x_{max}}$, and only the quantitative relationship between them varied. I.v.L.

08 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; telemetry; tracking; and wave propogation. *For tracking stations see*: 10 Facilities, Research and Support. *For related information see*: 06 Auxiliary Systems; 09 Electronics; 15 Instrumentation and Photography; and 22 Navigation and Guidance.

N64-10087* Aeronutronic, Newport Beach, Calif. Astrosciences Dept.
INVESTIGATION OF THE ORBITAL TRACKING OF A GEOSTATIONARY SATELLITE. VOLUME I OF II: THEORY AND METHODS
Feb. 12, 1962 56 p refs
(NASA Contract NAS8-1639)
(NASA CR-52204; U-1539) OTS: $5.60 ph, $1.88 mf

Results are conveyed of an investigation of the orbital tracking of a geostationary satellite. Consideration is given to various tracking concepts, accuracies, frequencies, and tracking deviations in an effort to determine the effects of uncertainties in observation quantities on the orbit parameters as they are propagated in the orbit correction technique. The method of least squares is the mathematical tool employed in the analysis, under the assumption that the uncertainties in the observation are randomly distributed. An effort was also made to determine the effect of bias errors on the orbit determination method and, depending on the magnitude of the effect, to [illegible] certain schemes for treating these biases. The bias in [illegible] location, uncertainties in gravitational and celestial [illegible] uncertainty in the velocity of propagation, and atmospheric refraction correction uncertainties are enumerated. C.L.

N64-10112 Library of Congress, Washington, D.C. Aerospace Information Div.
TRACKING OF MISSILES AND SPACE VEHICLES, REVIEW OF SOVIET LITERATURE AID Work Assignment 12 [Aug. 1962-Dec. 1962]
Feb. 21, 1963 26 p refs
(AID P-63-24; 19) OTS: $2.60 ph, $0.98 mf

A report is given which is a part of a series reviewing Soviet development in tracking missiles and space vehicles. Topics covered in this report are: electromagnetic problems, ion clouds and ionosphere perturbations, and radioastronomy. C.L.

N64-10261 Stanford Research Inst., Menlo Park, Calif.
MINIMUM TIME TRACK DATA IN AIRWAYS DESIGN FOR THE NEW YORK-LONDON AIR ROUTE. PART I – MINIMUM TIME TRACK CHARACTERISTICS – SUMMER SEASON PART II – TIME PENALTIES USING ALTERNATE TRACKS TO THE MINIMUM TIME TRACK – WINTER AND SUMMER SEASON
Eldon J. Wiegman, Rex G. Hadfield, and Sidney M. Sereb[illegible] Sept. 1963 111 p refs
(Contract FAA/BRD-420)

The feasibility of utilizing minimum time tracks in airway design for the New York–London air route during the summer season was investigated. Two altitude–airspeed combinations are considered: 18,000 ft at 250 knots and 30,000 ft at 5[illegible] knots. Networks of fixed tracks of varying complexity are derived that approximate actual minimum time track configurations. Flight-time penalties incurred by using these various fixed-track networks are evaluated. The complexity of the network required to minimize the time penalties varies with airspeed. Time penalties and added route distances incurred on the New York–London air route by utilizing alternate tracks displaced at distances of 60, 120, and 180 nautical miles from the minimum time tracks are discussed. P.L.

N64-10322 Lockheed Missiles and Space Co., Sunnyvale, Calif.
NEAR FIELD PATTERN MEASUREMENTS: AN ANNOTATED BIBLIOGRAPHY
George R. Evans, comp. Apr. 1963 67 p 126 refs
(Special Bibliography SB-63-38; Rept. 6-90-63-50)

Various methods of pattern measurements are presented. It is shown that simplified methods of gain determination have been devised. Application can be made to the prediction of beamwidth and sidelobe level. Also, by a defocus principle, methods are presented for the measurement of Fraunhofer radiation patterns in the Fresnel region. Au[illegible]

N64-10420 Radio Technical Commission for Aeronautics, Washington, D.C.
MINIMUM PERFORMANCE STANDARDS – AIRBORNE ILS LOCALIZER RECEIVING EQUIPMENT
Feb. 14, 1963 78 p refs
(RTCA 20-63/DO-115; supersedes RTCA 89-54/DO-59) RTC[illegible] $1.50

Minimum performance standards for airborne Instrument Landing System (ILS) Localizer Receiving Equipment operating within the radiofrequency range of 108.0 to 112.0 Mc[illegible]

presented. Since the measured values of radio equipment performance characteristics may be a function of the method of measurement, standard test conditions and methods are also recommended. M.P.G.

N64-10492 Joint Publications Research Service, Washington, D.C.
SIDE COMPUTATION IN ELECTRONIC GEODETIC TRILATERATION BY THE CIRCULAR SURVEYING SYSTEM
Piotr Dabrowski Mar. 5, 1963 7 p refs Transl. into ENGLISH from Przeglad Geodezyjny (Warsaw), no. 11, Nov. 1962 p 454–455
(JPRS 17943; OTS-63-21246) OTS: $0.50

A method is given for calculating the shortest distance from an aircraft to the ground-base stations from only one pair of measured distances as well as for the case of larger numbers of measurements. A formula is given by which the error of the individual measurement can be determined. In the case of an electronic geodetic apparatus, the precision of distance measurements was found to depend upon numerous factors. R.T.K.

N64-10510 Joint Publications Research Service, Washington, D.C.
VOICE-FREQUENCY TELEGRAPHY SYSTEMS
V. S. Gurov, N. N. Yetrukhin, and M. B. Rabinovich June 6, 1963 219 p refs Transl. into ENGLISH of a monograph "Sistemy Tonal'noga Telegrafirovaniya", Moscow, Svyazizdat, 1962 p 3–206
(JPRS-19591; OTS-63-31001) OTS: $3.50

Voice-frequency telegraphy systems are described and discussed. Included were circuit features, layout of the voice-frequency telegraph equipment, specific design features of the systems, and transistorized voice-frequency telegraphy systems. C.L.W.

N64-10549 Texas Instruments Inc., Dallas
MANUAL FOR POLYMODAL VOCODER, VOLUME I, SECTIONS, I, II, III, IV Final Report, Part Two
Aug. 1963 224 p
(AFCRL-63-301 Pt. 2; HB-18-A63; AD-420870)

The manual contains a general description of the polymodal vocoder along with a listing of the operating characteristics of the system. A brief discussion is also given of the operating procedure for the system, describing each control on the control console; the theory of operation is investigated. Tuning procedures for the active filters and alignment procedures for the voltage-controlled amplifiers are presented, along with detailed descriptions of critical circuits which aid in troubleshooting and maintenance. Schematic diagrams and assembly drawings of the printed circuit boards in the vocoder system are given. C.L.W.

N64-10618* Stanford Research Inst., Menlo Park, Calif.
A STUDY OF THE INFLUENCE OF COMMERCIAL COMMUNICATION SATELLITES Final Report
Richard G. Gould Jan. 1962 116 p refs
(NASA Contract NAS5-586)
(NASA CR-52393) OTS: $9.60 ph, $3.60 mf

This report describes proposed communication satellite systems and the advantages and disadvantages of each. Communication requirements are discussed and the system that best satisfies each requirement is indicated. The most important conclusion is that, while a random orbit system would satisfy the present requirement for transatlantic circuits, it would be incapable of satisfying many other communication needs. A stationary system would not only satisfy present and future needs on these high-density routes, but would satisfy many other anticipated communication requirements as well. Author

N64-10657 Joint Publications Research Service, Washington, D.C.
VHF COMMUNICATIONS IN AIR TRANSPORTATION
Karel Zavodsky May 29, 1963 13 p Transl. into ENGLISH of an article from Letecky Obzor (Prague), no. 12, Dec. 1962 p 390–392
(JPRS-19480; OTS-63-21949) OTS: $0.50

VHF communications in air transportation are reviewed in the light of: the basic characteristics of such communications, the geographical separation of the stations, and long-distance communications systems. I.v.L.

09 ELECTRONICS

Includes circuits and circuit theory; electronic components (e.g., tunnel diodes, transistors, and tubes); and feedback and control theory. *For related information see*: 06 Auxiliary Systems; 08 Communications; 15 Instrumentation and Photography; 22 Navigation and Guidance; and 25 Physics, Solid-State.

N64-10001 Joint Publications Research Service, Washington, D.C.
ON FEATURE CHARACTERISTICS AND THE SIXTH FEEDBACK LOOP, USSR
G. L. Otkhmezuri Oct. 9, 1963 18 p refs Transl. into ENGLISH of an article from Automatika (Kiev, USSR), no. 2, 1963
(JPRS-21375; OTS-63-31902) OTS: $0.50

The author introduces an indicator of the usefulness of independent signs, taking into account the conditional probability of the sign in the presence of an image. The properties of the cognitive system Alpha with the sixth positive feedback are considered. It is shown that the presence of neutral signs deteriorates the system. The dependence of the number of diagonal signs on the reliability of cognition is derived. Author

N64-10090* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
ON A METHOD OF SYNTHESIS OF NETWORKS
O. B. Lupanov Aug. 26, 1963 27 p refs Transl. into ENGLISH from Izvest. Vyssh. Ucheb. Zavend., Radiofizika (Gor'kiy), no. 1, 1958 p 120–140
(NASA Contract NAS7-100)
(NASA CR-52251; JPLAI/TRANS-36) OTS: $2.60 ph, $1.01 mf

A description of a certain general method for the synthesis of networks—for example, contact networks, contact parallel-series networks, and networks of functional elements—is given, and the previously known estimates of the complexity of these networks are improved upon. Author

N64-10095* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
PROGRAMMER ELECTRONICS. ATMOSPHERIC STRUCTURE SATELLITE EXPLORER XVII (S-6)

J. N. Libby and J. C. Schaffert Aug. 1963 70 p
(NASA TM X-50997; NASA X-632-63-068) OTS: $6.60 ph, $2.30 mf

Instrumentation for the atmospheric structure satellite Explorer XVII (S-6) is described. Included are discussions concerning the command programer system and the circuit descriptions. The command programer system includes program sequence, the experimental selector switch, calibrators, and squib circuitry. Circuit descriptions include the programer, programer electronics, experiment selector switch, experiment selector switch electronics, squib SCR circuitry, mass spectrometer calibrators, calibrator electronics and sequencer electronics. C.L.W.

N64-10096* Lockheed Missiles and Space Co., Sunnyvale, Calif.
ELECTROLYTIC PREPARATION OF HIGH DIELECTRIC THIN FILMS Quarterly Report, June 27-Sept. 27, 1963
S. A. Ring and J. B. Story [1963] 22 p refs
(NASA Contract NASw-765)
(NASA CR-52190) OTS: $2.60 ph, $0.86 mf

The method of preparation involves the anodization of a suitable metal substrate, and inclusion of additives in the porous anodized film to produce an oxide composite analogous to high dielectrics prepared by ceramic techniques. A brief survey of recent literature on high dielectric materials has been carried out. Results of exploratory investigations on films prepared by anodization to Ti substrates are presented. Author

N64-10109* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INVESTIGATION OF HF AND VHF ROCKET-BORNE SHROUD ANTENNAS
G. H. Spaid and J. R. Hagemeyer May 1963 24 p refs
(NASA TM X-51059; NASA-X-613-102) OTS: $2.60 ph, $0.92 mf

The shroud antenna system originally developed for the 38 Mc/76 Mc DOVAP tracking system, has been modified to meet the requirements of ionospheric experiments in which 24.5 and 73.6 Mc CW signals are transmitted from a rocket to the ground. These modifications were accompanied by significant improvements in matching and in preflight antenna adjustment techniques. In addition, it was found that shroud antennas could be used quite satisfactorily at frequencies lower than those used in the DOVAP system. Experimental results from two rocket flights showed that the antenna performance was in good agreement with theoretical predictions. Author

N64-10160* Honeywell, Seattle, Wash. Military Products Group
DEVELOPMENT OF A PROTOTYPE RADAR ALTIMETER Final Engineering Report
Aug. 9, 1963 97 p
(Contract ARDS-498)
(Doc. 1089)

This report describes the development of a prototype radar altimeter for use as the altitude data input for an automatic landing system. This prototype employs techniques new to the field of altimetry including: nanosecond pulses, zero frequency IF, unbalanced leading-edge tracking, and gated, automatic gain control. Accuracy is in the range of ±1.5 feet from zero altitude to 100 feet, and ±6 feet to ±12 feet at altitudes from 200 feet to 500 feet. An altitude rate output is furnished in addition to the altitude output. The report discusses altimeter design, capabilities and limitations, compatibility with autopilot and control systems, methods of test, calibration and maintenance, and the test program used for proving the efficacy of the altimeter. Author

N64-10247 Air Force Systems Command, Wright-Patterson AFB, Ohio
AN ULTRASONIC METHOD OF PRODUCING CHIP BREAKERS
V. N. Verezub, A. E. Potapenko, and Ye. S. Chistyshov Jan. 3, 1963 9 p refs Transl. into ENGLISH from Izv. VUZov, no. 8, 1960 p 115-119
(FTD-TT-62-1266/1+2+4; AD-295765)

An ultrasonic apparatus for preparing chip breakers on the forward face of ceramic or hard-alloy blades of a cutting tool is discussed. Two major parts of the apparatus are the generator and a magnetostrictive head. The generator requires 600 watts with a frequency range of 16 to 30 kilocycles and an operating frequency of 20 kilocycles. The magnetostrictive head consists of a magnetostrictive converter, an exponential concentrator, and the working tool. Conclusions from machine use include: (1) the ultrasonic method of making chip breakers on ceramic and hard-alloy blades completely excludes spoilage from burns, microcracks, and cavities; (2) any shape or chamfer, hole, or recess may be produced on the forward face; and (3) cleanness of the machined surface is within the limits of the 7th to 8th class. J.E.T.

N64-10260 Page Communications Engineers, Inc., Washington, D.C.
LONG-DISTANCE VHF COMMUNICATIONS GROUND ANTENNA ARRAY Final Report
Jan. 15, 1963 137 p
(Contract FAA/BRD-373)

The antenna described is for use in the troposcatter mode, VHF communication at distances up to 600 nmi for air-traffic control. It is a ground-situated array of fixed azimuthal position, and is capable of reception as well as transmission. The array is composed of eight vertical 60° corner reflectors, each containing 16 half-wavelength vertical dipoles. One corner section is used for transmitting and all eight for receiving. A system of preamplifiers and phasing networks is used to provide the required multiple receiving beams. Author

N64-10410 National Bureau of Standards, Boulder, Colo. Radio Standards Lab.
A TECHNIQUE FOR EXTRAPOLATING THE 1 KC VALUES OF SECONDARY CAPACITANCE STANDARDS TO HIGHER FREQUENCIES
R. N. Jones Nov. 15, 1963 18 p refs
(NBS-TN-201) GPO: $0.15

A simple technique is described for extrapolating the 1 kc values of certain two-terminal capacitors to higher frequencies without incurring serious losses in accuracy. The method is intended for use with air capacitors having binding post or banana plug type connectors. Because of inherent errors, such connectors are not appropriate for measurement where the highest accuracy is required. Author

N64-10415 European Atomic Energy Community, Brussels (Belgium)
FAST LOW LEVEL PULSE DISCRIMINATOR
E. De Blust, I. De Lotto (C.I.S.E.), and V. Mandl Joint Nucl. Res. Center, Ispra Estab. (Italy), Aug. 1963 46 p refs
(EUR 406.e) Available from Belgium American Bank and Trust Co., N.Y., account No. 121.86: 70 Belg. Fr.

The behavior of the tunnel diode in a fast low-level pulse height discriminator is analyzed. The characteristics of the tunnel diode in fast trigger circuits are studied by plotting the switching waveforms for nonlinear load and variable-input pulse amplitude and shape. The relations between the switching time, the "lambda" pulse, and the hysteresis are considered and extended also to the classical trigger circuits. As a result of the analysis a discriminator circuit has been developed after an investigation of the different bias circuits. The lowest threshold level is about 2 mv and the input range is higher than 100. The linearity is satisfactory over the whole range, and good temperature stability can be achieved with a simple and cheap thermostat. Author

N64-10463 Electrotechnical Lab., Tokyo (Japan)
RESEARCH ON THE PRIMARY STANDARD OF CURRENT USING SHORT-CIRCUITED-RING FOR HIGH FREQUENCIES
Yoshikazu Aida Jan. 1963 102 p refs
(*Its* Researches No. 639)

A short-circuited ring-type electrodynamic ammeter to be used for establishing the accurate, absolute standard of current at high frequencies is described. The basic relationship between the electrodynamic torque and the restoring torque, which have hitherto been defective on the electrodynamic ammeter, are studied. After developing a new, precise theory of operations concerning static and dynamic methods, the unstable balance, astatic oscillation, nonlinear oscillation, as well as general characteristics have been clarified. Starting from Maxwell's equation, the method of determining electrical constants is derived. By using the constants obtained above, the formulas for current have been introduced with sufficient accuracy over a very wide frequency range. The instrument, which is suitable for accurate measurements of current, was carefully designed and minutely manufactured, taking into account the results of the theoretical studies, and possible mechanical limitations. Author

N64-10477 Joint Publications Research Service, Washington, D.C.
SOVIET REPORTS ON BLOCK CIRCUITS AND THEORY OF SEQUENCES
V. V. Glagolev and A. G. Lunts Feb. 6, 1963 19 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (Moscow), v. 144, no. 6, 1962 p 1237–1244
(JPRS-17504; OTS-63-21063) OTS: $0.50

The first paper is concerned with the problem of designing tests for switching systems. The individual classes of switching circuits which simplify the design of minimal, or close to minimal, tests by virtue of the circuit features are considered. The possibility of designing unit open-switch tests and unit closed-switch tests is approached, and applicable theorems are proved. The second paper discusses the p-adic method in the theory of sequences. The p-adic numbers are interpreted as p-number system sequences (in particular, when p = 2, as binary sequences), the sum as a functional element, with inputs as the terms and the output as the sum, and the product with p as a delay element. This interpretation made possible the application of the algebra of p-adic numbers and p-adic analysis to the investigation of circuits which transform p-number sequences. R.T.K.

N64-10508 Joint Publications Research Service, Washington, D.C.
STRUCTURAL METHODS IN THE THEORY OF CONTROL AND ELECTRIC AUTOMATION
A. S. Shatalov May 7, 1963 1242 p refs Transl. into ENGLISH from the book "Strukturnyye Metody v Teorii Upravleniya i Elektroavtomatike", Moscow, 1962 p 1–408
(JPRS-19084; OTS-63-21759) OTS: $13.50

This book elucidates theoretical problems of automatic control and electric automation from the aspect of structural investigation methods. Analyzed is the effect of inner components which characterize the structure of elements and the complex control systems, as well as additional connections employed to obtain stability, precision, and other indices of system. A mathematical device is described which is needed in the use of structural methods, based on the Laplace and Fourier conversions, and designed for use in control systems with alternating as well as constant parameters. The majority of these problems are oriented toward solutions by modulation methods. The complex dynamic processes in electric furnaces, electric machines, electric automatic parts, and synthesized complex control systems are described in a manner understandable to engineers. Author

N64-10537 Rome Air Development Center, Griffiss AFB, N.Y.
INSERTION LOSS DESIGN OF CRYSTAL FILTERS Final Report
Robert G. Mc Laughlin Oct. 1963 51 p refs
(RADC-TDR-63-402; AD 422437)

This report is concerned with the use of piezoelectric quartz crystals in insertion loss filters. The Cauer approximation is used, based on the Jacobian elliptic functions. Methods for realizing low-pass filters in a lattice or bridged-T form with restrictions are shown. A general method for inserting crystals into symmetric bandpass filters is shown. The minimum inductance transformation and its usefulness are briefly described. The roots of the numerator of the insertion loss function of n=9 low-pass filters with a reflection coefficient of 20% have been calculated on a computer and are presented. Author

N64-10555 Naval Ordnance Lab., Corona, Calif.
HALL EFFECT INVESTIGATIONS Quarterly Progress Report, 1 Oct.–31 Dec. 1962
H. H. Wieder and A. R. Clawson Feb. 15, 1963 24 p refs
(NAVWEPS-8148; AD-299456)

Indium antimonide films deposited on pyrex substrates and subsequently annealed in vacuum at a temperature of the order of 400° C exhibit an improvement in their galvanomagnetic properties which does not occur for films deposited on soft glass substrates. Alloying In with InSb films and simultaneously causing their recrystallization produces a sharp increase in the transverse magnetoresistive coefficients of such films and a preferential orientation of the crystallographic (111) plane parallel to the major plane of the substrate. Large-scale electrode–geometrical effects as well as Corbino effects are absent in these alloyed films. Author

N64-10569 Joint Publications Research Service, Washington, D.C.
JUNCTION OF QUARTZ WITH METAL
L. V. Nikolayev Mar. 5, 1963 9 p refs Transl. into ENGLISH of an article from Pribory i Tekh. Eksperimenta (USSR), no. 5, Sept.–Oct. 1962 p 174–176
(JPRS-17936; OTS-63-21242) OTS: $0.50

A method for obtaining a stress junction of quartz with metal in the manufacturing of waveguide windows for UHF devices is described. The method involves making the window plate from melted quartz and joining it to the metal clamp by soldering with an active metal, such as titanium. The quality of the junction and its reliability depend on the clearance between the clamp and the quartz plate. Before soldering, this clearance should correspond to a sliding fit with reference to techniques requiring the second class of precision. These junctions are vacuum sealed and have high thermomechanical strength. I.v.L.

N64-10583 Joint Publications Research Service, Washington, D.C.

USE OF LOGARITHMIC AMPLITUDE CHARACTERISTICS FOR CALCULATING THE ENTROPY OF OUTPUT PROCESSES OF AUTOMATIC CONTROL SYSTEMS

A. I. Ressin May 17, 1963 14 p refs Transl. into ENGLISH from Avtomat. i. Vychistitel'-naya Tekkn. (Riga), no. 2, 1962 p 29–38

(JPRS-19242; OTS-63-21839) OTS: $0.50

A method is presented for using logarithmic amplitude characteristics in calculating the entropy of random processes related to the functioning of continuous operation control systems. The structure of informational criteria, using the concept of entropy, in a one-dimensional stationary linear system, is discussed. The frequency band of a control system, (Ω), is defined as the band corresponding to the decrease in amplitude of the output signal in comparison with the amplitude of harmonic effect in the input per given number of times (decrease per given number of decibels). Given the specified decrease in the signal, the corresponding value is found according to the logarithmic characteristic. A practical index of the transmission band in the control system is the crossover frequency ($\Omega_{crossover}$) of its logarithmic amplitude characteristic. P.V.E.

N64-10588 Joint Publications Research Service, Washington, D.C.

SYMPOSIUM ON THE THEORY OF RELAY DEVICES AND FINITE AUTOMATA

M. A. Gavrilov May 29, 1963 7 p Transl. into ENGLISH of an article from Vestn. Akad. Nauk SSSR, no. 4, Apr. 1963 p 85–88

(JPRS-19483; OTS 63-21951) OTS: $0.50

Papers and reports on the subjects of abstract automata theory, probability automata, signal construction theory, reliability theory, relay structure design methods, minimization of Boole functions and bridge structure synthesis, and the mechanization of synthesis and analysis functions were presented by Soviet specialists at a symposium in Moscow on September 29 to October 2, 1962. J.E.T.

N64-10591 Joint Publications Research Service, Washington, D.C.

OPTIMAL CONTROL IN LINEAR SYSTEMS WITH TIME LAGS

N. N. Krasovskiy June 24, 1963 12 p refs Transl. into ENGLISH of an article from Zibirskiy Mat. Zhur. (Moscow), v. 4, no. 2, 1963 p 295–302

(JPRS-19822; OTS-63-31103) OTS: $0.50

This report considers the problem of determining the stabilizing action of a controller which will minimize the integral quadratic error in a linear control system with time lags. The problem is solved by the small parameter method. I.v.L.

N64-10622 Hughes Aircraft Co., Culver City, Calif.

EPITAXIAL DEPOSITION OF SEMICONDUCTOR MATERIALS; AN ANNOTATED BIBLIOGRAPHY

C. L. M. Blocher, M. Bloomfield, and T. J. Lyndon Oct. 1963 68 p refs

(LS-BIB-63-3)

This bibliography covers references on the epitaxial growth of semiconductor materials. The bibliography has been divided as follows: (1) general articles on the theory and techniques of epitaxial deposition and survey articles, (2) germanium, (3) silicon, (4) deposition for both germanium and silicon, and (5) other semiconductor materials. R.T.K.

N64-10627 Joint Publications Research Service, Washington D.C.

SOVIET DEVELOPMENTS IN ELECTRONICS

Jan. 21, 1963 32 p refs Transl. into ENGLISH of eight articles from Pravda (Moscow), and Izv. (Moscow), Nov. 25, 196

(JPRS-17220) OTS: $3.60

CONTENTS:

1. AN IMPORTANT FACTOR IN TECHNICAL PROGRESS M. Likhachev (Pravda, p 3) p 1–4
2. WONDERS OF MICROELECTRONICS V. Ovin (Pravda, p 3) p 5–11
3. ON THE WAY TO AUTOMATING MENTAL WOR K. Karandeyev (Pravda, p 3) p 12–13
4. MAINLINE OF PROGRESS A. Shokin (Izv., p 5) p 14–19
5. BRAIN OF AUTOMATION Yu. Vasilevskiy (Izv., p 5) p 20–22
6. MOLECULAR GENERATORS (Izv., p 5) p 23–25
7. WHAT CAN ELECTRONICS DO? (Izv., p 5) p 26–2
8. SURGICAL RECORDER (Izv., p 5) p 29

N64-10640 Joint Publications Research Service, Washington, D.C.

STUDY OF THE SINTERING OF OXIDES BY THE ELECTRICAL CONDUCTIVITY METHOD

S. F. Pal'guyev, L. D. Yushina, and Yu. M. Ovchinnikov Ma 25, 1963 10 p refs Transl. into ENGLISH of an article fro publ. "Elektrokhimiya Rasplaylennykh Solevykh i Tverdyk Elektrolitov" (Sverdlovsk), no. 2, 1961 p 193–197

(JPRS-18350; OTS-63-21420) OTS: $0.50

The suitability of the electrical conductivity method for the study of the sintering of the hard oxides, when there was n formation of a liquid phase, was investigated. The study wa conducted using cerium dioxide with additions of 5.0 mola percent of BeO, 10.0 molal percent of MgO, 15.0 molal pe cent of CaO, and 9.0 molal percent of SrO. The change in th electrical resistance of the samples, as a function of the tim of exposure to differing sintering temperatures, was studie The termination of the sintering of the samples was determine by the establishment of a constant electrical resistance. Th completeness of the sintering of the oxides as a function of com position and temperature was judged on the basis of curve showing electrical resistance as a function of time. It was con cluded that the measurement of electrical conductivity of th oxide samples during sintering can serve as a sensitive metho for the study of this process. R.T.K.

N64-10644 Joint Publications Research Service, Washington, D.C.

INCREASING RECEIVER SENSITIVITY IN THE PRESENCE OF TWO SIGNALS WITH COINCIDENT FREQUENCY SPECTRA

Yu. N. Babanov Apr. 22, 1963 10 p Transl. into ENGLISH of an article from Radiotekhnika (Moscow), v. 17, no. 12, Dec. 1962 p 48–51

(JPRS-18802; OTS-63-21618) OTS: $0.50

Theoretical calculations are presented showing the possibility of separating, in a receiver, two AM signals with completely overlapping spectra. A block diagram is given of the special stage which effects the signal separation. Autho

N64-10648 Joint Publications Research Service, Washington, D.C.

INVESTIGATIONS ON WEAR OF ELECTRICAL CONTACTS USSR

Oct. 16, 1963 75 p refs Transl. into ENGLISH of four articles from the book "Elektricheskiye kontakty" (Electrical Contacts—Proc. of the 26–28 Nov. 1956 Conf.) Moscow, State Publ. House of Elec. Eng., 1958
(JPRS-18926; OTS-63-21692) OTS: $2.00

The manufacturing and breaking properties of metal–ceramic electrical contacts are discussed to provide a basis for the powder metallurgical study of high-voltage breaking switches. Such contacts are found to be very useful in circuits wherein the contacts are subjected to wearing conditions or where they must suffer the effects of weldings. The study shows the alloys Ag-Cu and Ag-Si-Mg and other age-hardenable alloys capable of increasing the wear resistance of electrical contacts, but the results with an Ag-Ni alloy show that this is not always the case. D.E.R.

N64-10667* Advanced Kinetics, Inc., Costa Mesa, Calif.
APPROXIMATION OF AN IDEAL DIPOLE WITH A SOLENOID
C. T. Benson Repr. from J. Appl. Phys. v. 34, no. 10, Oct. 1963 p 3136–3137 refs
(NASA Contract NASw-702)

It is desirable, in the case of experiments which require the simulation of the terrestrial field or of other strong dipoles, to obtain a detailed description of the magnetic field outside a solenoid and particularly in the regions so close to the conductor boundary that the dipole behavior is appreciably modified by local contributions. With this in mind, formulas have been derived which give the magnetic field of a square-end coil as a dipole field plus error terms. I.v.L.

10 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands and wind tunnels); test ranges; and tracking stations. *For related information see*: 06 Auxiliary Systems.

N64-10073 Advisory Group for Aeronautical Research and Development, Paris (France)
LOCATING AND SYNCHRONIZING FLIGHT RESEARCH TRACKING STATIONS
Edward Durbin July 1962 63 p 17 refs Presented at the 21st Meeting of the Flight Mechanics Panel of AGARD, Paris, July 6–10, 1962
(AGARD-407)

Mobile tracking ships are being used to an increasing extent as scientific activity in space continues to expand. This report describes the various navigation systems which are known, and examines the fundamental accuracy limitations of each type. Author

N64-10113* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
THE DEEP SPACE INSTRUMENTATION FACILITY Space Programs Summary, July 1, 1963–Aug. 31, 1963
Sept. 30, 1963 77 p refs
(NASA Contract NAS7-100)
(NASA CR-52144; JPL-SPS-37-23, Vol. III) OTS: $7.60 ph, $2.51 mf

Space program of the Deep Space Instrumentation Facility (DSIF) precision tracking and data-acquisition network, which is designed to track, command, and receive data from deep space probes, are summarized in the following areas: (1) engineering development—(a) L-band acquisition aid, (b) Mark I ranging subsystem, (c) GSDS telemetry data encoder, (d) computer-controlled antenna-pointing system, (e) advanced antenna system (AAS) wind-data gathering system, (f) high-power test laboratory, (g) systems engineering, and (h) computer programs; (2) research and development—(a) ground antennas, (b) planetary radar project, (c) lunar radar project, (d) ranging-system development, and (e) S-band implementation for DSIF; and (3) advanced antenna system. P.V.E.

N64-10234 Deutsche Forschungsanstalt für Luft- und Raumfahrt, Brunswick (W. Germany) Inst. für Triebwerksanlagen
THE MEASUREMENT OF THE AVERAGE PRESSURES OF PULSATING GAS STREAMS WITH THE AID OF CARRIER MEASURING APPARATUS [DIE MESSUNG DES MITTLEREN DRUCKES VON PULSIERENDEN GASSTROMEN MIT HILFE VON TRAGEN MESSGERATEN]
H. G. Heinrich July 1963 71 p refs In GERMAN
(DFL-209)

The determination of the mean pressure per unit time in a pulsating gas flow, with sufficient accuracy, is possible by the analysis of the oscillograms of pressure gages. This method, however, is time consuming and requires a great deal of apparatus. For this reason, the possibility of using fluid manometers was investigated. Results indicate that the U-tube is very practical for the mean-pressure determination. The construction of the junction between the place where the pressure is taken and the U-tube has great influence on the reading. Therefore, directions for choosing the junction, the equalizing volume, and the restrictor were derived from theoretical analysis. The accuracy of the considerations taken in this investigation was confirmed by the test results.
Transl. by I.v.L.

N64-10320 Texas U., Austin
REPORT ON VISITS TO SOME EUROPEAN LABORATORIES
B. B. Kinsey Washington, AEC Div. of Tech. Inform., Sept. 30, 1963 13 p
(TID-18275) OTS: $0.50

A brief account of the buildings and equipment of the new nuclear physics laboratory of the University of Texas is presented. Similar European laboratories were visited to obtain general information on the layout and instrumentation necessary for research. J.E.T.

N64-10323 Aeronautical Research Council (Gt. Brit.)
THE 7IN. × 7IN. HYPERSONIC WIND TUNNEL AT R.A.E. FARNBOROUGH. PART IV – MEASUREMENTS OF DIFFUSER PERFORMANCE, BLOCKAGE, STARTING LOADS AND HUMIDITY
J. F. W. Crane and J. G. Woodley London, Min. of Aviation, 1938 28 p refs
(ARC-CP-663; supersedes RAE-TN-AERO-2859, ARC-24647)
Available from HMSO: 5s 6d

The performance of the diffuser is analyzed, for a conventional closed-jet tunnel with a two-dimensional M = 7 nozzle, and for a type of free-jet tunnel resulting from the combination of an axisymmetric M = 8.6 nozzle and a two-dimensional working section. Some results of model blockage are given together with a new correlation of closed-jet tunnel results. Starting loads measured on two models show that the load

varies with back pressure and may be reduced to insignificant size. Humidity measurements show that the technique of drying-by-compression is satisfactory. Author

N64-10340* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN ATMOSPHERE ENTRY SIMULATOR
Carlton Bioletti [1959] 19 p refs Presented at the 27th Shock and Vibration Symp., Fort Bliss, El Paso, Tex., Feb. 25–27, 1959
(NASA TM X-51119) OTS: $1.60 ph, $0.80 mf

A simulator was designed on the basis of the following simplifying assumptions: (1) that radiation has a secondary effect on missile heating; and (2) that gravity has a secondary effect on missile motion. A hypervelocity gun launches the model with the required entrance velocity into the test chamber. A two-stage light gas gun is used to study simulation of atmospheric entry of long-range ballistic missiles. Results indicate that the described atmosphere entry simulator may be used as a "go or no-go gage"; that is, if a model survives the traverse through the simulator, it may be concluded that the full-scale missile will survive the reentry trajectory simulated. The apparatus may also be used to compare the performance of different heat-shield materials and different missile shapes with a fair degree of quantitative accuracy, with the objective of minimizing heat-shield weight. R.T.K.

N64-10346* Grumman Aircraft Engineering Corp., Bethpage, N.Y.
OPERATION MANUAL FOR AN INERTIAL SIMULATOR WITH A TYPE OF AUTOMATIC DAMPING CONTROL SUITABLE FOR A ROTATING MANNED SPACE STATION
E. Caprioglio and R. Bower Sept. 1962 11 p refs
(NASA CR-50791; MD-108200-MI) OTS: $1.60 ph, $0.80 mf

An inertial simulator with a type of automatic damping control suitable for a rotating manned space station is described. The device is supported on a ball and socket air bearing. This air bearing offers a minimum of friction to the movements of the device and, within certain mechanical limits, simulates an environment of free space. This report covers the requirements and procedures necessary for proper operation of the simulator and control system in the conduction of tests utilizing this equipment. R.T.K.

N64-10347* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A MAGNETICALLY ROTATED ELECTRIC ARC AIR HEATER EMPLOYING A STRONG MAGNETIC FIELD AND COPPER ELECTRODES
Robert F. Mayo, William L. Wells, and Milton A. Wallio Washington, NASA, Nov. 1963 51 p refs
(NASA TN D-2032) OTS: $1.25

A magnetically rotated direct-current electric-arc air heater employing water-cooled copper electrodes capable of operation at high power and high pressure with negligible test stream contamination has been successfully developed. Considerable improvement in arc air-heater stability characteristics and reduction of electrode erosion rates over those previously encountered in arc air heaters utilizing constricted arcs, was obtained by employing an intense magnetic field. The developed heater, small in physical size, has exhibited excellent operating characteristics over the full range of conditions investigated to date: stagnation pressures to 74 atm, electrode input powers to 1200 kw, arc voltages to 470 v, arc currents to 3,800 amp, and magnetic field strengths to 28,500 G. Author

N64-10409 Atomic Energy Commission, New York, N.Y. New York Operations Office
IONIZATION CHAMBERS FOR ENVIRONMENTAL RADIATION MEASUREMENTS
Arthur Shambon, Wayne M. Lowder, and William J. Condo Feb. 1963 45 p refs
(HASL-108); OTS: $1.00

The development of ionization chambers for precise dosimetric measurements of environmental gamma and cosmic radiation in the field is described. The design, calibration and evaluation of 20-liter air ion chambers, and high-pressure argon and nitrogen chambers, are discussed in terms of the well-known difficulties associated with field surveys of environmental radiation. Auth

11 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; 13 Heat Transfer and Thermodynamics; and 24 Physics, Plasma.

N64-10015 Aeronautical Research Council (Gt. Brit.)
SOME MEASUREMENTS OF SHOCK-WAVE ATTENUATION IN CHANNELS OF VARIOUS CROSS-SECTIONS
L. Bernstein (London U.) 1963 40 p refs
(ARC R&M-3321; Replaces ARC-22619) HMSO: 15s.

Shock-attenuation measurements in uniform, converging and diverging channels are described, together with measurements of hot-flow duration and pressure variation. The apparatus is also described. It is concluded that a channel convergence provides an attractive means of alleviating attenuation, particularly as it barely affects the hot-flow region Auth

N64-10017 Aeronautical Research Council (Gt. Brit.)
A SINGLE-PARAMETER THEORY OF VORTEX FLOW IN TURBO-MACHINES
D. S. Whitehead and G. S. Beavers (Cambridge U.) London Ministry of Aviation, 1963 39 p refs
(ARC-R&M-3335; replaces ARC-23209) HMSO: 15s

The paper gives a theory of vortex flow in turbomachines in which the basic assumption is made that the axial-velocity profiles always belong to a family governed by a single parameter, λ. This parameter is a measure of the radial displacement of the streamlines. The flow equations then reduce to single linear differential equation for λ, and a corresponding simplification of ideas about the way in which these flows behave is achieved. Comparison with experimental results by Horlock and more accurate calculations by Wu, shows that the theory is sufficiently accurate for design purposes. The theory is applied to compressors with a large number of identical stages and it is shown how a rapid solution may be obtained by matrix methods. Examples of flow in a ten-stage compressor are given, and the effects of variation of mass flow and of modifications to the inlet guide vanes are demonstrated. Auth

N64-10018 National Physical Lab., Teddington (Gt. Brit.) Aerodynamics Div.
ON CONVECTION VELOCITIES IN TURBULENT SHEAR FLOWS

J. A. B. Wills Jan. 10, 1963 29 p refs
(NPL/AERO/1050; ARC 24427)

An experiment shows that, in the shear layer of a circular jet, the convection velocity of turbulent fluctuations defined by peaks of the space–time correlation has a value which depends on the value of space or time separation. An alternative approach based on a wave number/velocity spectrum has more significance in many problems, and measurements are presented. Author

N64-10025 Max-Planck-Inst. für Strömungsforschung, Göttingen (W. Germany)
EXPERIMENTAL INVESTIGATIONS ON THE SCATTERING OF SOUND IN A TURBULENT STREAM [EXPERIMENTELLE UNTERSUCHUNGEN UBER DIE STREUUNG VON SCHALL IN TURBULENTER STROMUNG]
D. Schmidt 1962 73 p refs In GERMAN
(Sponsored by AFOSR)
(*Its* Mitt. 28)

A wind-tunnel investigation was conducted on sound scattering in a turbulent flow. The theoretical assumptions were verified by measurements and could, in certain instances, be carried beyond the area encompassed by theory. The sound damping, which resulted from the sound scattering, proved to be proportional to the square of the sound frequency and proportional to the square of the Mach number of the turbulence. A formula was derived which permits an estimation of the turbulent damping of directional sound (for example, aircraft sound in the free atmosphere). Trans. by I.v.L.

N64-10142* Argonne National Lab., Ill.
QUASI-STEADY ASPECTS OF THE ADJUSTMENT OF SEPARATED FLOW REGIONS TO TRANSIENT EXTERNAL FLOWS
H. K. Ihrig Jr., and H. H. Korst Repr. from AIAA Journal, v. I, no. 4, Apr. 1963 p 934–936 refs
(NASA Grant NSG 13-59)

The adjustment of separated flow regions with respect to pressure, mass, and heat transfer to transient external flows is investigated using several characteristic times. The adequacy of a quasi-steady treatment is demonstrated, and a quasi-steady solution for the supersonic two-dimensional base pressure problem is presented as an illustration. Experimental data are presented for a transient external flow and compared to the quasi-steady solution for this case. It is concluded that, although initial response to pressure waves is very rapid, the adjustment due to mass and heat transfer is much slower, and, as a result, short-duration experiments on separated flows should come under special scrutiny for correct interpretations of results. Author

N64-10241 Aeronautical Research Council (Gt. Brit.)
THE BOUNDARY LAYER DRAG OF BODIES WITH SWEPT TRAILING EDGES IN SUPERSONIC FLOW
J. C. Cooke London, HMSO, Feb. 1963 20 p
(ARC-CP-699; replaces RAE-TN-AERO-2867; ARC-24739) HMSO: 4s

An earlier paper gave expressions for the drag of a body with its trailing edge lying in a plane normal to the direction of flow at infinity. The present note extends these results to a body with its trailing edge in the form of any smooth, closed, twisted curve. In particular, it covers swept trailing edges whose angle of sweep may be variable. Author

N64-10290* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
SHOCK-TUBE STUDY OF CARBON DIOXIDE DISSOCIATION RATE
Theodore A. Brabbs, Frank E. Belles, and Steven A. Zlatarich Repr. from Chem. Phys., v. 38, no. 8, Apr. 15, 1963 p 1939–1944 refs
(NASA RP-51)

The homogeneous dissociation rate of carbon dioxide, diluted with large amounts of argon, was measured in a shock tube by two independent methods: (1) by the single-pulse technique, in which the gas reacts behind a reflected shock, is quenched by a rarefaction wave, and is later analyzed chemically; and (2) by measurements of light intensity in the blue continuum due to $CO_2(^3\Pi) \rightarrow CO_2(^1\Sigma) + h\nu$. The results of the two experiments agree. The rate is given by $d[CO]/dt = k[CO_2][M]$, with $k = 3 \times 10^{11} T^{1/2} \exp(-86{,}000/RT)$ cm^3 $moles^{-1}$ sec^{-1}. Author

N64-10312 Atomic Energy Commission, New York, N.Y. Health and Safety Lab.
AEROSOL PENETRATION THROUGH 9 MIL HV-70 FILTER PAPER WITH AND WITHOUT PINHOLES
J. W. Thomas and G. D. Crane Washington, AEC Div. of Tech. Inform., Aug. 1963 27 p refs
(HASL-139) OTS: $0.75

Studies were made of the penetration of two polydispersed dioctylphthalate aerosols of different particle size distribution through 9-mil HV-70 type filter paper, with and without pinholes, at several different air velocities. It was found that the penetrations of the two aerosols of different particle size differed greatly for an intact filter, but approached the same value for the filters containing pinholes. To account for the pinhole effect, a generalized equation was developed which relates change of aerosol penetration through a filter to air linear velocity. This equation was confirmed within limits. Author

N64-10404 Aeronautical Research Council (Gt. Brit.)
THE STEADY FLOW OF A VISCOUS FLUID PAST A CIRCULAR CYLINDER AT REYNOLDS NUMBERS 40 AND 44
C. J. Apelt (Oxford U.) London, Min. of Aviation, 1963 31 p refs
(ARC-R&M-3175; ARC-20502) Available from HMSO: 11s

This paper describes the numerical solution of the complete Navier–Stokes equations for the steady flow of an incompressible viscous fluid of unlimited extent past a circular cylinder at Reynolds number 40. A new device developed for the numerical solution is described. The results of the investigation are: (1) A steady-state solution does exist at Reynolds number 40 and is in good agreement with experimental results. (2) It seems that steady-state solutions are possible for somewhat higher Reynolds numbers even though they may not exist in nature. A solution has been obtained at Reynolds number 44, but it has not been carried to the same accuracy as the solution at Reynolds number 40. (3) The length of the stationary vortex pair attached to the downstream portion of the cylinder continues to increase with Reynolds number in such steady-state solutions up to a Reynolds number 44, and no indication has been found that this process will not continue as the Reynolds number is increased beyond 44. Author

N64-10417 College of Aeronautics, Cranfield (Gt. Brit.)
NON-NEWTONIAN FLOW IN INCOMPRESSIBLE FLUIDS. PART III. SOME PROBLEMS IN TRANSIENT FLOW
A. Kaye June 1963 44 p refs
(CoA-N-149)

Some transient flows are investigated, using a rheological equation of state for an incompressible fluid of the form:

$$p_{ij} - p\delta_{ij} = 2\int_{-\infty}^{t}\left(\frac{\partial\Omega}{\partial J_1}\,S_{ij} - \frac{\partial\Omega}{\partial J_2}\,S_{ij}^{-1}\right)\,dt'$$

where Ω is a function of J_1 and J_2, the invariants of the Cauchy–Green deformation tensor S_{ij}, which relates the deformation at the present time t with that at some past time t'. Ω is also a function of t and t'. It is found that a material obeying the above equation of state will show elastic and stress relaxation effects and may be of some use in investigating these properties in concentrated polymer solutions and melts. Author

N64-10441* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
THE FLUCTUATING WALL PRESSURES UNDER A SEPARATED SUPERSONIC FLOW
A. L. Kistler [1963] 21 p refs
(NASA Contract NAS7-100)
(NASA CR-52528) OTS: $2.60 ph, $0.83 mf

Measurements have been obtained of the pressure fluctuations under the turbulent, separated region ahead of a forward-facing step at Mach numbers of 3.01 and 4.54. These pressures are significantly larger than the pressures produced by an attached boundary layer. The data can be interpreted as showing that the pressure fluctuations originate from two distinct causes: fluctuations due to changes in the geometry of the separated region and fluctuations due to the turbulent free shear layer. The levels to be expected from each cause can be estimated from a simple model. Author

N64-10467* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
EXPERIMENTAL INVESTIGATION OF THE BEHAVIOR OF A CONFINED FLUID SUBJECTED TO NONUNIFORM SOURCE AND WALL HEATING
Bernhard H. Anderson and Michael J. Kolar Washington, NASA, Nov. 1963 42 p refs
(NASA TN D-2079) OTS: $1.00

The motion of a fluid contained in a tank was studied under the following heating conditions: (1) nonuniform source heating in which most of the heat is generated near the tank bottom; (2) wall heating; and (3) nonuniform source heating in conjunction with wall heating. Data were obtained under nonflowing and flowing conditions. Where nonuniform source heating was present, the results indicated that there was mixing such that a constant temperature in the axial direction was produced. Wall heating always produced a stable temperature gradient near the liquid surface, which tended to be carried with the fluid during discharge. For nonuniform source heating, the temperature-time histories measured at the tank exit during fluid discharge could be predicted adequately by using a complete mix analysis. The temperature profile in the stratified layer, which was covered by wall heating, tended to be carried with the fluid during discharge and appeared to exhibit the property of similarity. Author

N64-10472 Canadian Armament Research and Development Establishment, Valcartier
AN APPROXIMATE METHOD FOR CALCULATING HYPERSONIC NONEQUILIBRIUM AIRFLOWS PAST BLUNT BODIES
D. Ellington Oct. 1963 16 p refs Submitted for Publication
(CARDE-TR-458/63)

A relatively simple, noniterative, direct, approximate method is described for determining the chemical, thermodynamic and dynamic state of the inviscid nonequilibrium shock layer surrounding a blunt body in hypersonic airflow. The method used is an extension of that due to Freeman, the chemical model comprising an interacting mixture of three Lighthill ideal dissociating gases. Solutions are compared with the results of some exact calculations, and good agreement is found. Author

12 GEOPHYSICS

Includes auroral phenomena; upper atmosphere studies; oceanography; cartography; geodesy; and geomagnetism. *For Van Allen belts see*: 28 Space Radiation. *For related information see*: 05 Astronomy and Astrophysics; 21 Meteorology; and 29 Space Sciences.

N64-10058* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EFFECT OF AURORAL BREMSSTRAHLUNG ON THE LOWER IONOSPHERE
A. C. Aikin and E. J. Maier Washington, NASA, Nov. 1963 13 p refs
(NASA TN D-2096) OTS: $0.50

Ionization of the lower ionosphere by electrons from a type-I aurora is discussed. The primary electrons produce ionization in the altitude range where in quiet conditions there is normally no ionization at night, but where the ionization during the day results from solar Lyman α and X-ray radiation. The bremsstrahlung resulting from the assumed flux of auroral electrons produces significant ionization at low altitudes (50 to 70 km) where normally cosmic rays are the only source of ionization. For certain values of the relevant parameters, predicted electron and ion densities are given for comparison with the charged particle profiles calculated for the case of no auroral flux. Author

N64-10077* Space Technology Labs., Inc., Redondo Beach, Calif.
THE ORBITING GEOPHYSICAL OBSERVATORY TEST AND SUPPORT PROGRAM
W. A. Schanbacher and C. A. Schorken N.Y., Am. Inst. of Aeron. and Astronautics 1963 22 p Presented at the AIAA Space Flight Testing Conf., Cocoa Beach, Fla., Mar. 18–20, 1963
(AIAA Paper 63-065) AIAA: $0.50 members, $1.00 nonmembers

The following areas of the testing and support program are discussed: (1) objectives of the test program; (2) written procedures; (3) system tests; (4) electrical tests and support equipment: attitude control, power system, communication and data handling, and automatic test loop; (5) mechanical tests and support equipment: spacecraft handling equipment, mechanical testing, mechanical alignment and tests, pneumatic tests, and design qualification. P.V.E.

N64-10078* Israel Program for Scientific Translations, Ltd., Jerusalem
PROBLEMS OF THEORETICAL SEISMOLOGY AND PHYSICS OF THE EARTH'S INTERIOR [VOPROSY TEORETICHESKOI SEISMOLOGII I FIZIKI ZEMNYKH NEDR]
V. A. Magnitskii, ed. 1963 152 p refs Transl. into ENGLISH from Tr. Inst. Fiz. Zemli, Akad. Nauk. SSSR (Moscow), no. 11, 1960 10 p refs
(NASA TT F-123; OTS-63-11178; IPST Cat. 814) OTS: $1.50

Papers are presented on the following topics: (1) statistical theory of nonhomogeneous turbulence; (2) effects of pressure on diffusion coefficients in solids; (3) viscosity of the interior of the earth; (4) whether the moon can sustain a magnetic field by hydromagnetic amplification; (5) an equation-of-state for some metals at high pressure; (6) heat transfer by excitons in the earth's mantle; (7) interpretation of the main gravity anomalies of the earth; (8) transition of solid helium to the metallic phase at high pressure; (9) functional methods in the linear theory of elasticity; (10) generalization of data on earthquake mechanisms; (11) spherical waves in an inhomogeneous fluid; (12) stress-field variations in earthquakes; and (13) longitudinal and transverse plane waves in an infinite Maxwell medium. M.P.G.

N64-10086* Geophysics Corp. of America, Bedford, Mass.
A ROCKET-BORNE 44-60 A GEIGER COUNTER
C. A. Accardo, H. G. Gross, and L. H. Weeks May 1963 38 p refs
(NASA Contract NASw-500)
(NASA CR-52164; GCA-TR-63-14-N) OTS: $3.60 ph, $1.34 mf

The report constitutes the preliminary work in the design and construction of a 44A to 60A Geiger counter for use in sounding rockets. The counter response as a function of orientation with respect to the sun is investigated both theoretically and experimentally. The counter will be included in seven Nike-Apache payloads to be flown during the solar eclipse of July 20, 1963, for studying the ionosphere. Author

N64-10092* Smithsonian Astrophysical Observatory, Cambridge, Mass.
ULTRAVIOLET SYNTHESIS OF ADENOSINE TRIPHOSPHATE UNDER POSSIBLE PRIMITIVE EARTH CONDITIONS
Cyril Ponnamperuma, Carl Sagan, and Ruth Mariner July 10, 1963 21 p refs
(NASA CR-52132; SAO-Special Rept.-128) OTS: $2.60 ph, $0.83 mf

The synthesis of nucleoside phosphates by ultraviolet irradiation of dilute solutions of purine or pyrimidine bases, pentose sugars, and phosphorus compounds was attempted. Results indicate that adenosine triphosphate (ATP) and other nucleoside phosphates can be formed in high yield under simulated primitive earth conditions, e.g., by ultraviolet irradiation of dilute aqueous solutions of adenine, ribose, and ethyl metaphosphate. R.T.K.

N64-10115 Academy of Sciences (USSR), Moscow Soviet Geophysical Committee
INTERNATIONAL GEOPHYSICAL YEAR BIBLIOGRAPHY OF LITERATURE PUBLISHED IN RUSSIAN IN 1961
G. D. Aslanova, R. F. Zatrutina, L. S. Rubina, and V. A. Sokolova, comps. 1963 149 p refs In RUSSIAN; ENGLISH foreward and table of contents

N64-10120 Joint Publications Research Service, Washington, D.C.
GEODETIC WORK IN HUNGARY
E. Gegoczi Nov. 6, 1963 12 p refs Transl. into ENGLISH of an article from Acta Tech. Acad. Sci. Hung. (Budapest), v. 18, no. 1–2, 1957
(JPRS-21748; OTS-63-41074) OTS: $0.50

A discussion is given concerning triangulation in Hungary, including the drawing up of a new net which consists of a double ring and two complementary nets. A diagram of the ring system is given. The northern chain frames the Hungarian–Czechoslovakian border, and its points are therefore partly on Hungarian territory and partly on Czechoslovakian territory. The total length of the chains that form the ring system is approximately 1250 km, that of the western ring 720 km, and that of the eastern ring (including the middle chain) is 710 km. The number of points in the chains is 112; the points form 132 triangles—34 are towers, the rest are pylons. The average length of the sides of the triangles is 30 km. C.L.W.

N64-10132* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
GEOMAGNETIC DISTURBANCES
Masahisa Sugiura Rep. from Trans. Amer. Geophys. Union, v. 44, no. 2, June 1963 p 421–424 refs
(NASA RP-47)

A review is given of research activities concerning geomagnetic disturbances from 1960–1963. The advancement in this field during this time period is attributed to the recognition of the importance of the magnetosphere in the interpretation of geomagnetic disturbances. Magnetic measurements have been made with instruments aboard Pioneer 1, Pioneer 5, Explorer 10, and Explorer 12; and plasma measurements made with Mariner 2 have established the existence of a steady flow of plasma from the sun. The shape of the magnetospheric boundary and the sudden commencement of magnetic storms are among the topics studied extensively. Observations by satellites and space probes have been limited to high-energy particles, and direct observational verification of the ring current has not been made. Phenomena observed simultaneously at magnetically conjugate areas have also been investigated. R.T.K.

N64-10162 Joint Publications Research Service, Washington, D.C.
SOVIET RESEARCH ON THE EARTH'S MAGNETIC FIELD
Oct. 29, 1963 44 p refs Transl. into ENGLISH of four articles from Uch. Zap. Liningr. Gos. Univ., Ser. Fiz. i Geol. Nauk Voprosy Geofiz. no. 13(303), 1962
(JPRS-21641; OTS-63-41028) OTS: $1.25

CONTENTS:

1. MEASUREMENT OF THE COMPONENTS OF THE EARTH'S MAGNETIC FIELD BY THE PROTON RESONANCE METHOD V. D. Lomanyy, A. G. Prokof'yev, and B. M. Yanovskiy p 1–15 refs (See N64-10163 01-12)
2. THE USE OF NATURAL ELECTROMAGNETIC PULSATIONS FOR INVESTIGATION OF THE EARTH'S UPPER LAYERS M. N. Berdichevskiy, B. Y. Bryunelli, A. Y. Lantsov, and O. M. Raspopov p 16–23 refs (See N64-10164 01-12)
3. CONSTRUCTION OF MAGNETO-TELLURIC SOUNDING CURVES FROM RECORDS OF SHORT-PERIOD PULSATIONS OF THE EARTH'S NATURAL ELECTROMAGNETIC FIELD A. A. Kovtun p 24–36 refs (See N64-10165 01-12)
4. THE INFLUENCE OF THE EARTH-AIR DISCONTINUITY ON THE ELECTRIC FIELD OF A POLARIZED SPHERE G. A. Tarasov p 37–41 refs (See N64-10166 01-12)

N64-10163 Joint Publications Research Service, Washington, D.C.
MEASUREMENT OF THE COMPONENTS OF THE EARTH'S MAGNETIC FIELD BY THE PROTON RESONANCE METHOD
V. D. Lomanyy, A. G. Prokof'yev, and B. M. Yanovskiy *In its* Sov. Res. on the Earth's Magnetic Field Oct. 29, 1963 p 1–15 refs (See N64-10162 01-12) OTS: $1.25

An apparatus for measurement of the vertical component Z of the earth's magnetic field is described. A Helmholtz coil, with radius sufficient to ensure the uniformity of the field in a volume which exceeds the volume of the sensor in the circuit used in the free nuclear-induction method, is used to compensate for errors inherent in other systems. Results are given in tabular form. J.E.T.

N64-10164 Joint Publication Research Service, Washington, D.C.
THE USE OF NATURAL ELECTROMAGNETIC PULSATIONS FOR INVESTIGATION OF THE EARTH'S UPPER LAYERS
M. N. Berdichevskiy, B. Ye. Bryunelli, A. Ye. Lantsov, and O. M. Raspopov *In its* Sov. Res. on the Earth's Magnetic Field Oct. 29, 1963 p 16-23 refs (See N64-10162 01-12) OTS: $1.25

Two methods of magnetotelluric exploration for the study of the earth's crust are described—magnetotelluric profiling (MTP) and magnetovariation exploration (MVE). MTP involves the recording of short-period pulsations (T = 10 to 60 sec) of the geoelectric field and the horizontal components of the geomagnetic field at a single point. The mean ratio of the amplitudes of these pulsations gives some idea of the total conductivity of the electric profile, making it possible to draw conclusions as to the relief of the high-resistance reference horizon. The MVE method is similar to the telluric-current method presently used widely in geophysical exploration, with the single difference that geomagnetic rather than geoelectric pulsations are recorded. Results of the use of these two systems are discussed, and a magnetotelluric profile of the Druskininkay–Sovetsk area is given. The correctness of the basic theoretical concepts considered has been confirmed by results thus far. J.E.T.

N64-10165 Joint Publications Research Service, Washington, D.C.
CONSTRUCTION OF MAGNETO-TELLURIC SOUNDING CURVES FROM RECORDS OF SHORT-PERIOD PULSATIONS OF THE EARTH'S NATURAL ELECTROMAGNETIC FIELD
A. A. Kovtun *In its* Sov. Res. on the Earth's Magnetic Field Oct. 29, 1963 p 24-36 refs (See N64-10162 01-12) OTS: $1.25

The basic assumptions of the magnetotelluric sounding theory, random errors associated with these assumptions, and the measurement of these errors are discussed. J.E.T.

N64-10166 Joint Publications Research Service, Washington, D.C.
THE INFLUENCE OF THE EARTH-AIR DISCONTINUITY ON THE ELECTRIC FIELD OF A POLARIZED SPHERE
G. A. Tarasov *In its* Sov. Res. on the Earth's Magnetic Field Oct. 29, 1963 p 37-41 refs (See N64-10162 01-12) OTS: $1.25

A method for estimating the distorting influence of the earth–air discontinuity on the electric field of a vertically polarized, ideally conducting sphere is presented. J.E.T.

N64-10178* Iowa State U., Iowa City
THE MORPHOLOGY OF THE ELECTRON DISTRIBUTION IN THE OUTER RADIATION ZONE AND NEAR THE MAGNETOSPHERIC BOUNDARY AS OBSERVED BY EXPLORER XII
John Wright Freeman, Jr. (Ph.D. Thesis) June 1963 123 p refs
(NASA Grant NsG-233-62)
(NASA CR-52300; SUI-63-20) OTS: $10.10 ph, $3.89 mf

Salient features observed include: confirmation of the enhancement of soft electron fluxes and diminution of hard electron fluxes in the outer zone during magnetically disturbed times; the outward motion of the outer zone hard electron maximum during periods of enhancement; confirmation of the general Chapman and Ferraro picture of a well-defined magnetosphere with compression of the geomagnetic field during the initial phases of magnetic storms; the existence of a layer of quasi-thermalized plasma immediately outside the magnetosphere; confirmation of the result of Frank and Van Allen that the contours of constant counting rate for E $\geq$40 kev electrons tend to protrude outward near 90° from the subsolar point and draw closer to the earth on the night side; and general support for the result of Gringauz, Kurt, Moroz, and Shklovskii, that there exists a region beyond some 8 R_e on the night side of the earth dominated by very-low-energy electrons. Author

N64-10200 Joint Publications Research Service, Washington, D.C.
ATMOSPHERIC ELECTRIC MEASUREMENTS IN THE ELBRUS REGION
N. V. Krasnogorskaya Oct. 25, 1963 30 p refs Transl. into ENGLISH from Tr. El'Brusskoy Ekspeditsii (USSR), v. 2, no. 5, 1961 p 108-126
(JPRS-21,604; OTS-63-41008) OTS: $0.75

Complex measurements of elements of atmospheric electricity in clouds and precipitation, obtained at high-mountain stations, are discussed. Results presented include the following: (1) air conductivity decreases when clouds are present at the station in comparison with that of cloudless weather; the relative decrease of both positive and negative conductivity in clouds is approximately identical; (2) there is no dominant adsorption of negative conductivity in ions by water drops at the investigated stage in cloud development; (3) current density of the precipitation usually was opposite in sign to the potential gradient of the electric field; (4) measurement of polar conductivity in a cloud near the earth's surface revealed that cloud drops interact with both positive and negative light ions, and that there is no dominant adsorption of negative ions; and (5) raindrops acquire their principal charge in the cloud and lose it while falling from the cloud to the earth due to the electric conductivity of the air. P.V.E.

N64-10202 Joint Publications Research Service, Washington, D.C.
THE CALCULATION OF PLUMB-LINE DEFLECTIONS ON THE BASIS OF GRAVITY ANOMALIES
V. G. Kolmogorov Oct. 29, 1963 14 p refs Transl. into ENGLISH from Geol. i Geofiz. (Novosibirsk) no. 8, 1963 p 100-106
(JPRS-21648; OTS-63-41031) OTS: $0.50

This article describes a method for computing plumb-line deflections. These determine the figure of the geoid and its position with respect to the reference ellipsoid, and also characterize the distribution of geologic masses within the earth's crust. Author

N64-10203 Joint Publications Research Service, Washington, D.C.
THE SCATTERING OF ELECTROMAGNETIC WAVES BY TURBULENT INHOMOGENEITIES OF THE TROPOSPHERE
V. I. Tatarskiy and G. S. Golitsyn Nov. 4, 1963 120 p refs Transl. into ENGLISH from Tr. Inst. Fiz. Atmos. (Moscow), no. 4, 1962 p 147-202
(JPRS-21717; OTS-63-41057) OTS: $2.50

The theory of scattering of radio waves in the troposphere is discussed. An illustrative physical representation of the mechanism of random scattering of radio waves in homogeneous media is developed. Formulas are developed for the initial integral equations for the scattered field in the Fraunhofer diffraction zone, for the representation of the scattered field in terms of the spectrum of the refractive index, for the statistical Bragg formula, for the scattering by random inhomogeneities in the Fresnel diffraction approximation, for the microstructure of the fluctuations of the dielectric constant in a turbulent atmosphere, for the average scattered power for real wave profiles, for the correlation functions of the scattered field, for the statistical properties of the scattered field, and for the scattering of a pulsed wave. In conclusion, the physical interpretation of the derived formulas are discussed. D.E.R.

N64-10223 Weapons Research Establishment (Australia)
THEORETICAL MODELS FOR THE BRIGHTNESS OF CONTAMINANT GLOW CLOUDS IN THE UPPER ATMOSPHERE
K. H. Lloyd July 1963 49 p refs
(Tech. Note HSA-84)

A discussion is given of the theoretical variation in brightness which would be observed across a diffusing glow cloud released in the upper atmosphere. A Gaussian distribution for the contaminant number density is used, and it is assumed that when chemical reactions occur, either the contaminant density is everywhere very small, or an insignificant quantity of contaminant is consumed. Both the cases of chemiluminescence and scattering of the sun's rays are examined, and the effects on the observed brightness of absorption, reemission, and scattering of radiation within the cloud are considered. The results may be used to interpret observations on upper-atmosphere contaminant releases. Author

N64-10225 Weapons Research Establishment (Australia)
A DISCUSSION OF THE REACTIONS AND DATA RELEVANT TO PHOTOCHEMICAL OZONE CALCULATIONS
B. G. Hunt June 1963 40 p refs
(Tech. Note SAD-123)

The reactions which are relevant to the photochemical distribution of ozone in an oxygen atmosphere are discussed, and a survey of the data used in some recent photochemical ozone calculations is presented. The values of the data used are tabulated. Author

N64-10226 Weapons Research Establishment (Australia)
THE EFFECT OF VARIATIONS IN THE PARAMETERS CONTROLLING THE EQUILIBRIUM OZONE PROFILE IN THE ATMOSPHERE
B. G. Hunt Aug. 1963 39 p refs
(Tech. Note SAD-124)

In this investigation an attempt has been made to define the limits of the variations in the ozone distribution attributable to uncertainties arising from inadequate knowledge concerning the processes which occur in the photochemical reactions, and from possible errors existing in the data. For this reason, these studies have been limited to an atmosphere at rest, in which photochemical equilibrium is assumed to have been attained, and in which the only reactive gas is taken to be oxygen. Photochemical ozone profiles and total ozone amounts for various cases corresponding to different values of the data used in the calculations are presented, and the likely variations of the ozone profile have been shown to be small, provided that the value used for the rate constant k_{13} in this report is correct. The ozone distributions obtained are compared with experimental results and with previous photochemical ozone distributions, the agreement with the latter being quite close. Author

N64-10227 Weapons Research Establishment (Australia)
IONOSPHERIC DATA FOR AUGUST 1962 FROM WOOMERA, SOUTH AUSTRALIA
July 1963 24 p
(Ionospheric Data Bull. CPD-1962/8(W))

Tables of the hourly values of the customary ionospheric parameters are given. Author

N64-10228 Weapons Research Establishment (Australia)
IONOSPHERIC DATA FOR SEPTEMBER, 1962 FROM WOOMERA, SOUTH AUSTRALIA
Aug. 1963 24 p
(Ionospheric Data Bull. CPD-1962/9(W))

Tables of the hourly values of the customary ionospheric parameters are given. Author

N64-10256 Sandia Lab., Albuquerque, N. Mex.
THE EFFECT OF ROW CHARGE SPACING AND DEPTH ON CRATER DIMENSIONS
L. J. Vortman and L. N. Schofield Nov. 1963 170 p refs
(SC-4730(RR))

Forty row charges were fired in the Albuquerque fan-delta alluvium to define row-charge crater dimensions in terms of charge burial depth and the spacing between charges in the row. Sixty single charges were detonated at various burial depths for comparison. The factors limiting equivalence between row-charge craters and continuous line-charge craters are defined in terms of length of the row charge and also in terms of both burial depth and spacing. When the most efficient charge spacing was used, the optimum burial depth for row charges was 10 percent greater than the burial depth at which optimum crater dimensions were obtained from a single charge of the same weight. Channels were found to have a uniform width at a maximum charge spacing greater than the maximum spacing at which a uniform depth was obtained. The burst depth and spacing for the most efficient use of row charges is defined in this report, and the loss in cratering efficiency resulting from failure to work at optimum burst depth or optimum spacing can be evaluated from information obtained from this experiment. Author

N64-10268 Joint Publications Research Service, Washington, D.C.
THE NATURE OF THE MAGNETIC ANOMALIES IN THE TRANSITION REGION FROM THE ASIATIC CONTINENT TO THE PACIFIC OCEAN
A. G. Gaynanov and O. N. Solov'yev Nov. 4, 1963 6 p refs
Transl. into ENGLISH from Doklady Akad. Nauk SSSR (Moscow), v. 151, no. 6, Aug. 21, 1963 p 1399-1401
(JPRS-21715; OTS-63-41055) OTS: $0.50

Calculations of the depths of the upper and lower edges of the magnetically disturbed masses were performed for various parts of the region of the Sea of Okhotsk, and the sections of the Pacific Ocean adjacent to the Kurile Island arc and southern Kamchatka in order to ascertain the nature of the magnetic anomalies in this region. For the region of the Okhotsk upland, the upper edges of the magnetically disturbed bodies lie at depths of 3 to 9 km (h_1), and the lower edges lie at depths of 10 to 16 km (h_2). For the north Okhotsk and Sakhalin depressions, the following magnitudes were obtained: h_1 = 3 to 5 to 13 to 18 km, and h_2 = 27 to 34 km. For the ocean regions adjoining the southern and central Kuriles, h_1 = 4 to 16 km and h_2 = 18 to 34 to 40 km at the Kurile deep water basin. From this analysis, it is concluded that the transitional zone from the Asiatic Continent to the Pacific Ocean is characterized by peculiar anomalies of the magnetic field, which are not merely explained by the structure of the crust, but also by the structure of the upper mantle. P.V.E.

N64-10276 Joint Publications Research Service, Washington, D.C.
SOVIET RESEARCH ON THE IONOSPHERE AND GEOMAGNETISM
Nov. 6, 1963 67 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 3, no. 5, 1963 p 816–822, 858–867, and 961–975
(JPRS-21739; OTS-63-41069) OTS: $1.75

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2. A METHOD FOR INVESTIGATION OF THE STRUCTURE OF THE IONOSPHERE BY THE GROUND RECEPTION OF ARTIFICIAL EARTH SATELLITE RADIO SIGNALS N. A. Mityakov et al p 19–35 refs (See N64-10278 01-12)

3. CORRELATION OF ELECTRICAL CONDUCTIVITY OF SOLIDS AND THEIR PHYSICAL AND CHEMICAL PROPERTIES V. Ye. Kashprovskiy (Acad. Sci. USSR) p 36–53 refs (See N64-10279 01-12)

4. CONDUCTIVITY AND SIZE OF THE NONCONDUCTING LAYER IN THE CASE OF A CYLINDRICAL MODEL OF THE EARTH IN APPLICATION TO D_{st} VARIATIONS N. M. Rotanova (Acad. Sci. USSR) p 54–65 refs (See N64-10280 01-12)

N64-10277 Joint Publications Research Service, Washington, D.C.
RESULTS OF CRIMEAN RADIO OBSERVATIONS OF "COSMOS-1" AND "COSMOS-2" SATELLITES
N. A. Mityakov, E. E. Mityakova, and V. A. Cherepovitskiy (Gor'kiy State U.) *In its* Sov. Res. on the Ionosphere and Geomagnetism Nov. 6, 1963 p 1–18 refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 3, no. 5, 1963 p 816–822 (See N64-10276 01-12) OTS: $1.75

The results of processing the phase difference of coherent frequency signals at 20.005 and 90.0225 Mc as transmitted by Cosmos 1 and Cosmos 2 and received in the Crimea are presented. The ionospheric parameters obtained are compared with values obtained by vertical soundings, and also with the results of joint processing of the coherent frequencies phase difference and the rotation of the polarization plane. In addition to the normal variations of the integral electron concentration with altitude and time of day, irregular changes were also observed, especially in plots of the dN_n/dx relationship. M.P.G.

N64-10278 Joint Publications Research Service, Washington, D.C.
A METHOD FOR INVESTIGATION OF THE STRUCTURE OF THE IONOSPHERE BY THE GROUND RECEPTION OF ARTIFICIAL EARTH SATELLITE RADIO SIGNALS
N. A. Mityakov and E. Ye. Mityakova (Gor'kiy State U.) *In its* Sov. Res. on the Ionosphere and Geomagnetism Nov. 6, 1963 p 19–35 refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 3, no. 5, 1963 p 858-867 (See N64-10276 01-12) OTS: $1.75

A method of measuring the electron concentration in the ionosphere by recording the phase shift of coherent frequency signals transmitted from a satellite is generalized for the case of a medium which has both vertical and horizontal electron concentration gradients. The effect of rotation of the polarization plane of radio waves emanating from a satellite is also considered. Formulas are derived for calculating the quantity of electrons in a vertical column with unit cross section

$$\int_0^{Z_C} Ndz = N_n$$

and horizontal gradients dN_n/dx. Examples of computing the ionospheric parameters from two radio contacts with Cosmos 1 in the Crimea are presented. M.P.G.

N64-10279 Joint Publications Research Service, Washington, D.C.
CORRELATION OF ELECTRICAL CONDUCTIVITY OF SOLIDS AND THEIR PHYSICAL AND CHEMICAL PROPERTIES
V. Ke. Kashprovskiy (Acad. Sci. USSR) *In its* Sov. Res. on the Ionosphere and Geomagnetism Nov. 6, 1963 p 36–53 refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 3, no. 5, 1963 p 961–967 (See N64-10276 01-12) OTS: $1.75

The cause of the absence of correlation of soil conductivity (determined from the radio-station field intensity) and physical and chemical properties, etc., are considered. It is shown that the principal cause of this phenomenon is omission of the scattering effect of radio waves on the inhomogeneities in the relief. It is established that local soil conductivity is a phenomenon of static nature, and that a relationship exists between this conductivity and different types of soil. Salt and water conditions of soil also play an important role in conductivity. Taking these factors into account permits compilation of charts for the distribution of average soil conductivities and prediction of the electrical conductivity of soils in uninvestigated regions with the use of soil maps. A number of statistical characteristics of electrical conductivity of soils in the U.S.S.R. are given. Author

N64-10280 Joint Publications Research Service, Washington, D.C.
CONDUCTIVITY AND SIZE OF THE NONCONDUCTING LAYER IN THE CASE OF A CYLINDRICAL MODEL OF THE EARTH IN APPLICATION TO D_{st} VARIATIONS
N. M. Rotanova (Acad. Sci. USSR) *In its* Sov. Res on the Ionosphere and Geomagnetism Nov. 6, 1963 p 54–65 refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 3, no. 5, 1963 p 968-975 (See N64-10276 01-12) OTS: $1.75

The conductivity and size of the nonconducting layer for conductors possessing a nonuniform distribution of conductivity are determined on the basis of data for D_{st} variations in the case of a cylindrical model of the earth. Formulas are also derived for separately approximating the external and internal parts of the magnetic field observed at the earth's surface. Results of computations of conductivity and the nonconducting layer for several different places in the world are presented. These results, which are in general agreement with those obtained by Lahiri and Price, indicate that conductivity begins to increase very rapidly with increasing depth at a distance of 600 to 700 km below the surface. The value of the nonconducting layer at this depth and the conductivity below this depth were calculated to be of the order of 10^{-11} electromagnetic units. M.P.G.

N64-10281 Joint Publications Research Service, Washington, D.C.
SOVIET RESEARCH IN ATMOSPHEROLOGY AND GEOLOGY
Nov. 12, 1963 71 p Transl. into ENGLISH from Prirody (Moscow), v. 52, no. 8, Aug. 1963
(JPRS-21828; OTS-63-41120) OTS: $2.00

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N64-10282 Joint Publications Research Service, Washington, D.C.

THE EARTH'S MANTLE AND CURST

L. S. Tarasov (Inst. of Geochem. and Anal. Chemistry, Moscow) *In its* Sov. Res. in Atmospherology and Geol. Nov. 12, 1963 p 1–31 Transl. into ENGLISH from Priroda (Moscow), no. 8, 1963 p 3–17 (See N64-10281 01-12) OTS: $2.00

Major topics of discussion include: (1) chemical and physical nonuniformities of the earth; (2) primary matter of the earth; (3) meteorites and the earth's mantle; (4) differentiation of the mantle and the process of zonal melting; (5) peculiarities of processes in the mantle; and (6) degassing and melting as factors leading to formation of the earth's crust. J.E.T.

N64-10283 Joint Publications Research Service, Washington, D.C.

HOW TO INCREASE THE ACCURACY OF WEATHER FORECASTING – AN AUTOMATIC TELEMETERING HYDROMETEOROLOGICAL SYSTEM

V. P. Petrov *In its* Sov. Res. in Atmospherology and Geol. Nov. 12, 1963 p 32–44 Transl. into ENGLISH from Priroda (Moscow), no. 8, 1963 p 32–44 (See N64-10281 01-12) OTS: $2.00

A system of automatic hydrometeorological telemetering systems that will take automatic measurements and observations, collect their results, and transmit them to local and central weather bureaus is discussed. The bureaus will then supply weather information to all interested users. J.E.T.

N64-10284 Joint Publications Research Service, Washington, D.C.

OPTICAL PHENOMENA IN THE ATMOSPHERE

A. D. Zamorskiy (USSR) *In its* Sov. Res. in Atmospherology and Geol. Nov. 12, 1963 p 45–54 Transl. into ENGLISH from Priroda (Moscow), no. 8, 1963 p 62–66 (See N64-10281 01-12) OTS: $2.00

The accounts of sightings of halos near the Moon and the appearance of two images of the Sun, the planet Mercury, and pilot balloons are presented. The halos appear to be caused by reflections from ice crystals, and the double images appear to be caused by temperature inversions in the upper atmosphere. J.E.T.

N64-10285 Joint Publications Research Service, Washington, D.C.

THE FLAT HYDROGEN CLOUD AROUND THE EARTH

P. V. Shcheglov (State Astron. Obs.) *In its* Sov. Res. in Atmospherology and Geol. Nov. 12, 1963 p 55–62 Transl. into ENGLISH from Priroda (Moscow), no. 8, 1963 p 85–88 (See N64-10281 01-12) OTS: $2.00

Problems connected with the spectrographic observation of hydrogen in the earth's atmosphere are discussed. Better photographs of hydrogen spectra were obtained with an image converter that decreased the exposure time by a factor of 50. Resulting observations have shown that the emission of the red hydrogen line is enhanced considerably with an approach to the ecliptic and to the sun. J.E.T.

N64-10292* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ELASTIC MODELS OF THE MANTLE CORRESPONDING TO VARIATIONS IN THE EXTERNAL GRAVITY FIELD

William M. Kaula Repr. from J. Geophys. Res., v. 68, no. 17, Sept. 1, 1963 p 4967–4978 refs

(NASA RP-59)

Static earth-tide theory was modified to include interior loads expressible as spherical harmonies, and elastic moduli were assumed to be functions of radius only. Variations of density from this model and the corresponding stress distributions in the crust and mantle were calculated to correspond to observed variations in the gravitational field plus the surface topography up to the 4th-degree spherical harmonics. These solutions were made determinate by imposing the condition of minimization of strain energy. Modifications of the solution which take into account finite strain, creep, and viscous deformation are discussed. Author

N64-10296 Joint Publications Research Service, Washington, D.C.

GEOLOGICAL STUDIES IN THE ARCTIC AND SIBERIA

Oct. 7, 1963 36 p refs Transl. into ENGLISH from Geofiz. Metody Razvedkov v Arktike (USSR), no. 4, 1963 p 10–20 and 61–74

(JPRS-21348; OTS-63-31894) OTS: $1.00

CONTENTS:

1. STRUCTURE AND DYNAMICS OF MAGNETIC VARIATIONS IN THE ARCTIC AND SUBARCTIC B. A. Aleksandrov p 1–14 refs

2. THE DEEP GEOLOGICAL STRUCTURE OF THE UST'-YENISEY DEPRESSION AND ITS FRAMEWORK IN THE LIGHT OF NEW GEOPHYSICAL DATA Yu. G. Kiselev p 15–34 refs

N64-10298* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

AN EVALUATION OF VARIOUS GEOMAGNETIC FIELD EQUATIONS

Harold C. Euler and Peter E. Wasko July 1, 1963 63 p refs (NASA TM X-51072; MTP-AERO-63-60) OTS: $6.60 ph, $2.09 mf

The dipole and multipole approximations of the earth's main magnetic field are evaluated using Jensen and Whitaker's 568 Gaussian coefficients for Epoch 1955.0. The total geomagnetic field, which was computed to 16 earth radii for various geographic locations, is compared to values computed with the inverse cube law, and to some of the Vanguard III geomagnetic field observations. Author

N64-10304* National Bureau of Standards, Washington, D.C.

THE SPHEROIDAL METHOD FOR SATELLITE ORBITS

J. P. Vinti 1963 p 12–16 refs Repr. from The Use of Artificial Satellites for Geodesy; Proc. of the 1st Intern. Symp. on the Use of Artificial Satellites for Geodesy, Washington, Apr. 26–28, 1962 For abstract, see N63-20515 20-29

(Sponsored by NASA and AFOSR)

To calculate the orbit of an artificial satellite of an oblate planet, a very accurate approximation has been devised for its gravitational potential, leading to separability of the problem in oblate spheroidal coordinates. The present paper sketches the procedures for finding this potential and for calculating the corresponding orbit. It then discusses the remaining perturbing potential and a possible method of applying the calculated perturbed orbit for accurate determination of the earth's gravitational field. Author

N64-10355 Joint Publications Research Service, Washington, D.C.
THE STRATOSPHERE AND MESOSPHERE
L. A. Kozakov and V. A. Shtal' (Leningrad Hydrometeorological. Inst.) Nov. 21, 1963 11 p refs Transl. into ENGLISH from Priroda (Moscow), no. 9, 1963 p 17–21
(JPRS-21978; OTS-63-41193) OTS: $0.50

The structure and composition of the earth's atmosphere, especially the layers known as the stratosphere and the mesosphere, are discussed with regard to the importance they play in the determination of the temperature on the earth, their individual pecularities, and their role in aviation. The regular variation of the process in the stratosphere and the mesosphere is discussed, and more detailed studies of the upper atmosphere are recommended. D.E.R.

N64-10356* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
IMPROVED GEODETIC RESULTS FROM CAMERA OBSERVATIONS OF SATELLITES
W. M. Kaula Repr. from J. Geophys. Res., v. 68, no. 18, Sept. 15, 1963 p 5183–5190 refs
(NASA RP-62)

Analysis of Baker–Nunn camera observations of satellites $1959\alpha_1$, 1959η, $1960\iota_2$, $1961\delta_1$, and $1961\alpha\delta_1$, yielded results greatly improved over those previously reported. This improvement is due to the use of much more data, and to various modifications in the method of analysis. As indicated by the discrepancies between results from appreciably different orbits, the datum shifts obtained have standard deviations of ± 4 to ± 23 meters. The tesseral harmonic of the gravity field most firmly determined appears to be J_{41}, followed by J_{22}, J_{31}, J_{42}, J_{43}, and J_{32}. The principal sources of error suggested are the influence of preassigned variances on separation of gravitational coefficients having the same periodic effects on an orbit (e.g., J_{22} and J_{42}) and the holding, fixed with respect to each other, of stations on the same geodetic datum, but they do not seem adequate to explain all systematic discrepancies in the results. A comparison of gravitational and geometric geoid heights at station positions gave a mean equatorial radius of 6,378,196 ± 11 meters. Author

N64-10357* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
DIRECT MEASUREMENTS OF HELIUM AND HYDROGEN ION CONCENTRATION AND TOTAL ION DENSITY TO AN ALTITUDE OF 940 KILOMETERS
H. A. Taylor, Jr., L. H. Brace, H. C. Brinton, and C. R. Smith J. Geophys. Res., v. 68, no. 19, Oct. 1, 1963 p 5339–5347 refs
(NASA RP-63)

A Bennett-type ion mass spectrometer and a cylindrical electrostatic probe were carried to 940 km above Wallops Island, Virginia. The raw data from each unit (ion currents versus altitude) are presented and are interpreted in terms of helium, hydrogen, oxygen, and total ion concentration. The He^+ and H^+ concentrations derived from the ion mass spectrometer were found to rise steeply above 350 km, He^+ reaching a maximum value of 7×10^3/cc at 575 km, and H^+ increasing monotonically with altitude, ultimately reaching about 1.5×10^3/cc near apogee. These data are used with the O^+ concentrations derived from the electrostatic probe data to calculate the atmospheric temperature, the mean ion mass, and the total ion concentration as functions of altitude. The temperature of the upper *F* region was found to be 1235° ±40° K. The mean ion mass decreased from 16 amu at 400 km to 12 amu at apogee where it was decreasing rapidly. The measured ion distributions and those predicted by the theories of hydrostatic diffusion and ion-atom interchange are compared. Author

N64-10360* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC MAPPING OF THE GEOMAGNETIC FIELD
Joseph C. Cain and James R. Neilon (Weather Bureau) Repr. from J. Geophys. Res., v. 68, no. 16, Aug. 15, 1963 p 4689–4696 refs
(NASA RP-68)

Spheric harmonic representations are used to illustrate the application of the U.S. Weather Bureau machine-mapping system for drawing charts of the geomagnetic field. This technique is also applied to the representation of model S_q fluctuations by maps of electric current flow in the ionosphere. Author

N64-10384 Joint Publications Research Service, Washington, D.C.
SOVIET GEOPHYSICAL RESEARCH
Yu. D. Bulanzhe, A. A. Izotov, V. A. Magnitskiy, Yu. A. Meshcheryakov, N. S. Biagovalin et al Nov. 21, 1963 36 p refs Transl. into ENGLISH of four articles from Geofiz. Byul. (Moscow), 1962 p 74-84 and 88-102
(JPRS-21-967; OTS-63-41187) OTS: $1.00

Highlights in this review of Soviet geophysical research include the following: (1) the presentation of a measurement method which makes possible the tracing of relative secular variations in gravity with an accuracy of about 0.01 mgl; this method will provide a certain advancement in the problem of the constancy of the earth's gravitational field in time and will promote the more effective use of gravimetric measurements in the study of comtemporary movements of the earth's crust; (2) the formation of a Crimean geophysical polygon is proposed with the purpose of conducting an all-around study of the structure of the earth's crust and the laws of the contemporary tectonic movements on the basis of systematically repeated geophysical, geodetic, geological, and geomorphological observations, covering many years along a specially selected profile; and (3) the Soviet Geophysical Committee has contributed to the successful conclusion of operations in the Soviet Union in the field of planetary geophysics as well as the consolidation of international cooperation in the field of geophysics and allied sciences. Also, the conference of Ukranian geophysicists and astronomers is discussed. I.v.L.

N64-10398* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
ACOUSTIC HEATING OF THE POLAR NIGHT MESOSPHERE
Kaichi Maeda Washington, NASA, Nov. 1963 28 p refs (NASA TN D-1912) OTS: $0.75

As a part of the dynamical heating of the upper atmosphere, which has been emphasized by Hines, the acoustic heating of the upper air is reinvestigated, particularly the

warming of the polar night mesosphere. It is shown that, because of the relatively small transmissivity of the thermosphere for long-period sound waves, most acoustic hearing does not take place above the 200 km level, but rather below 100 km or around the mesopause. Although the acoustic output power from the polar jet stream is more than 10^5 times larger in winter than in summer, acoustic heating is not sufficient to compensate for the cooling rate around the mesopause in winter, unless the wind velocity of the polar night jet stream continually exceeds 200 m/sec. Author

N64-10414 Calif. Inst. of Tech., Pasadena
GEOLOGICAL SCIENCES AT THE CALIFORNIA INSTITUTE OF TECHNOLOGY: A REPORT FOR THE YEARS 1960 TO 1963 ON THE RESEARCH ACTIVITIES OF THE DIVISION OF GEOLOGICAL SCIENCES
1963 177 p refs

An annotated bibliography is presented of the research activities of the division of geological sciences. This bibliography covers the following areas: (1) geology, (2) geobiology, (3) geochemistry, (4) geophysics, and (5) planetary science. I.v.L.

N64-10423 National Bureau of Standards, Boulder, Colo. Central Radio Propagation Lab.
SYNOPTIC VARIATIONS AND VERTICAL PROFILES OF LARGE-SCALE IONOSPHERIC IRREGULARITIES
R. G. Merrill, R. S. Lawrence, and N. J. Roper Repr. from J. Geophys. Res., v. 68, no. 19, Oct. 1, 1963 p 5453–5459 refs Presented at the Spring Meeting of the U.S. Nat'l. Sci. Radio Union, Washington, D.C., Apr. 29–May 2, 1963

Analysis of Faraday rotation records obtained from observations of satellite $1958\delta_2$ during 18 months revealed that those irregularities that average 300 km in spatial extent occur mostly at night but show no seasonal variations, unexpectedly decrease in amplitude with increasing magnetic activity while showing no trend in spatial extent, and show negligible variation with satellite height and elevation angle. Three spaced stations aligned parallel to the path of satellite $1962\theta_1$ provided Faraday rotation records from which a vertical profile of irregularities was obtained. Author

N64-10427 Sandia Corp., Albuquerque, N. Mex.
THE UNIT CELL OF HODGKINSONITE
Edward J. Graeber and Abraham Rosenzweig (New Mex. U.) Nov. 1963 6 p refs
(Supported by AEC)
(SC-4964(RR)) OTS: $0.50

The mineral hodgkinsonite, $Mn(ZnOH)_2\ SiO_4$, was found to crystallize in space group $P2_1/c(C_{2h}^5)$. Single-crystal X-ray diffraction patterns of hodgkinsonite were obtained by both precession and Weissenberg methods. The unit cell data were obtained by superimposing a quartz pattern on the same film with hodgkinsonite. The unit cell data as well as X-ray power diffraction data obtained with FeK α radiation are presented. R.T.K.

N64-10457 Joint Publications Research Service, Washington, D.C.
POLAR AURORAE
S. I. Isayev and N. V. Pushkov Apr. 22, 1963 118 p refs Transl. into ENGLISH of book "Polyarnyye siyaniya", Moscow, USSR Acad. of Sci. Publ. House, 1958 112 p
(JPRS-18222; OTS-63-21631) OTS: $2.50

This book covers the following topics: development of views on polar aurorae; pattern form, classification, geographic distribution, and heights of polar aurorae; the relationship between polar aurorae and magnetic storms and solar activity; the spectra of polar aurorae; composition and temperature of the upper layers of the earth's atmosphere, based on aurorae data; radio and electrophotometric studies of polar aurorae; and theory of polar aurorae and propagation of radio waves. A review of these topics indicates that the now-existing theories for aurorae explain only their basic features. Advances in refining and expanding the knowledge of the upper layers of the atmosphere and the phenomena occurring in them were attained during the IGY (1957–1958), and it is felt that these studies of the aurorae will make a major contribution to the study of this as yet unsolved phenomenon. R.T.K.

N64-10473* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RELATION BETWEEN THEORETICAL AND OBSERVATIONAL MODELS OF THE UPPER ATMOSPHERE
I. Harris and W. Priester (Bonn U.) Repr. from J. Geophys. Res., v. 68, no. 20, Oct. 15, 1963 p 5891–5894 refs
(NASA RP-76)

A comparison between theoretical working models for the solar-cycle variation of the upper atmosphere and observational data obtained during times of medium and low solar activity is presented. Comparison with air densities observed within the period from 1958 to 1963 shows that the theoretical models give a good representation of the atmospheric properties and their changes during the decreasing phase of solar activity. A still better agreement is obtained if in the theoretical models the amount of helium is increased by a factor of 2.5 at the boundary of 120 km. However, this is important for periods of very low solar activity only. P.V.E.

N64-10474 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM GEOFIZICHESKAYA RAZVEDKA, [MOSCOW] GEOPHYSICAL EXPLORATION, NO. 6, 1961
Feb. 1, 1963 26 p Transl. into ENGLISH of four articles p 47–59, 93–95, 118–124
(JPRS-17412; OTS-63-21034) OTS: $0.75

CONTENTS:

1. THE USE OF HELICOPTERS IN TWO-MILLIGAL GRAVIMETRIC SURVEYS IN THE TUNDRA B. D. Poletayev p 1–5
2. EXPERIENCE IN THE USE OF THE MI-1 HELICOPTER IN CONDUCTING A GRAVIMETRIC SURVEY IN CONJUNCTION WITH BAROMETRIC LEVELLING B. P. Borodin p 6–12
3. THE GAK-3M GRAVIMETER WITH ELECTRICAL THERMOSTAT A. N. Timofeyev and V. N. Rozenberg p 13–15
4. ON THE ACCURACY OF ALTITUDE DETERMINATIONS FROM TOPOGRAPHIC MAPS DURING REGIONAL GRAVIMETRIC SURVEYS A. P. Yegorov p 16–23

N64-10482 Joint Publications Research Service, Washington, D.C.
TRANSIENT EFFECTS IN AN ELECTRODYNAMIC SEISMOGRAPH, CONSIDERING SEISMIC AMPLIFIER INPUT
M. K. Polshkov Feb. 12, 1963 12 p refs Transl. into ENGLISH of an article from Geol. i Geofiz., Akad. Nauk SSSR, Sibirsk. Otd. (Novosibirsk), no. 5, May 1962 p 90–96
(JPRS-17597; OTS-63-21117) OTS: $0.50

Transient phenomena of an electrodynamic seismograph are investigated, taking into account the input circuit of the seismic amplifier when the seismograph is installed in very mellow soils. These soils are characterized by considerable

absorption of energy from seismic oscillations. The investigations include: (1) the derivation of the differential equation for the movement of the seismograph transformer; (2) the derivation of the expression for the transient electrical voltage at the seismograph output; and (3) the examination of the effect of a change in each parameter of the coupled system (seismograph installed in mellow soil–amplifier input) on the nature and duration of transient phenomena arising in the instrument. Considering the minimal quasi-periodicity of the transient process and the relatively high and uniform sensitivity of the coupled system in a wide frequency band, equalization of the parameters of the system can be regarded as a highly effective variant of apparatus regulation when a seismograph is installed in soils with increased absorption of seismic oscillations. I.v.L.

N64-10483 Joint Publications Research Service, Washington, D.C.

THE SEISMICITY OF ALTAY

S. I. Masarskiy and F. D. Moiseyenko Feb. 13, 1963 10 p refs Transl. into ENGLISH of an article from Geol i Geofiz., Akad. Nauk SSSR, Sibirsk. Otd. (Novosibirsk), no. 8, Aug. 1962 p 104–106

(JPRS-17612; OTS-63-21121) OTS: $0.50

The sharp difference between the seismicity of the Mongolian (the most highly active seismic region) and the Soviet Altay is conspicuous in both severity and frequency. It is suggested that this difference is connected with the shape of the chief upheaval, narrow in its southeastern part where the pressures are concentrated on its smallest area and expanding toward the northwest, where the pressures are distributed over a greater area. The checked seismic data prove that the more recent formations on the Altay and the neighboring mountainous structures are still in formation. Judging from the coordination of numerous epicenters to the flanks of the latitudinally orientated Katun upheaval, there are, to date, tectonic dislocations on its western and eastern extremities and, concurrently, the central part is still in a stage of tectonic inactivity in relation to the neighboring zones. I.v.L.

N64-10484 Joint Publications Research Service, Washington, D.C.

ON THE RATIONAL PROFILING OF ISOOHMS FOR ELECTRICAL PROSPECTING MAPS

B. M. Smolni'kov Feb. 14, 1963 10 p refs Transl. into ENGLISH of an article from Nekotorye Vopr. Geofiz. Issled. ma Ukr. (Kiev), 1962 p 49–53

ENGLISH of an article from Nekotoryye Vopr. Geofiz. Issled. (JPRS-17646; OTS-63-21139) OTS: $0.50

Investigations were conducted in the analysis of interpolation errors in electrical prospecting maps. Results indicate that: (1) the isoohm profile determination must include the interpretation error which shows to what degree of precision the resistance values can be obtained on the given map; (2) the most rational isoohm profile for the map scales considered, 1:500; 1:1000; 1:2500; 1:5000; 1:10,000; 1:25,000, and 1:50,000; and 1:100,000, is equal to the triple value of the root mean square of the interpolation error E. An isoohm profile greater than 3E can lead to the distortion of the electrical field and, consequently, to its false interpretation. I.v.L.

N64-10489 Joint Publications Research Service, Washington, D.C.

ON THE ESTIMATION OF THE F2 LAYER DISTURBANCE IN THE HIGH LATITUDES

A. S. Besprozvannaya Feb. 26, 1963 21 p refs Transl. into ENGLISH from Mezhdunar. Geofiz. God., Sb. v Razdel Programmy MGG, Ionosfera, Acad. Sci. (Moscow), no. 5, 1960 p 81–92

(JPRS-17835; OTS-63-21212) OTS: $0.50

The possibility of an estimate of the F2-layer disturbance in the high latitudes by the method of the magnitude of deviation of critical frequencies, taking into account the peculiarities of the high latitudinal ionosphere, is considered. The analysis is based on data collected in ionospheric observations of the Tiksi Bay station during 1946–1955. A selection was made of the level of ionization of the F2 layer which corresponds to a quiet day; the variations of electron density of F2 layer on magnetically quiet days are presented. The anomalously elevated ionization of the F2 layer in the high latitudes is also discussed. A methodological approach that takes into account the peculiarities of the polar ionosphere was found to produce the most reliable estimate of the contribution of corpuscular radiation to the ionization of the F2 layer. R.T.K.

N64-10490 Joint Publications Research Service, Washington, D.C.

GRAPHOANALYTICAL METHOD OF CONSTRUCTING A HYPERBOLIC NET DURING RADIOGEODETIC OPERATIONS

Yu. I. Raynysh and R. I. Volkova Feb. 28, 1963 8 p refs Transl. into ENGLISH from Geofiz. Razvedka (Moscow), no. 6, 1961 p 124–129

(JPRS-17874; OTS-63-21223) OTS: $0.50

A simplified method of calculating and plotting a hyperbolic net for radiogeodetic operations is described. This method reduces the number of calculations and surveys by two-thirds, and its accuracy is comparable to that obtained by the analytical method. First, the base lines are drawn from a central location and the two unknown points. Each base line is the principal axis of a family of hyperbolas (the Y ordinate axis), and the X axis is drawn perpendicular to it at the center. An auxiliary rectangular net is drawn to simplify the formulae for the coordinates of the points of the hyperbolas, which points are identical with those drawn by the analytical method. D.E.R.

N64-10493 Joint Publications Research Service, Washington, D.C.

PRESENT STATE AND FUTURE TREND OF THE DEVELOPMENT OF GEOLOGICAL SCIENCES IN THE USSR

D. I. Shcherbakov Mar. 6, 1963 18 p refs Transl. into ENGLISH from Izvest. Akad. Nauk, SSSR, Ser. Geol. (Moscow), no. 1, Jan. 1963 p 9–18

(JPRS-17983; OTS-63-21262) OTS: $0.50

A brief enumeration of the fundamental progresses and achievements of Soviet geology during the postwar period is presented. P.V.E.

N64-10500 Joint Publications Research Service, Washington, D.C.

WORK IN GRAVIMETRY IN CZECHOSLOVAKIA

Mar. 21, 1963 8 p Transl. into ENGLISH of summaries of 2 articles from Geofysikalni Sb. 1960 (Prague), 1961 p 67–68 and 126–145

(JPRS-18266; OTS-63-21380) OTS: $0.50

CONTENTS:

1. ASTROGRAVIMETRIC LEVELING IN CZECHOSLOVAKIA Milan Bursa p 1–2

2. MEASUREMENTS WITH THE GS-12 GRAVIMETER IN THE CZECHOSLOVAKIAN GRAVIMETRIC NETWORK Vratislav Chuboda, Zdenek Simon, and Lubomir Trager p 3–5

N64-10522* National Aeronautics and Space Administration, Washington, D.C.
SETTLING TIME OF A FIXED AMOUNT OF OXYGEN IN THE ATMOSPHERES OF PLANETS CONTAINING WATER VAPOR [O VREMENI USTANOVLENIYA STATSIONARNOGO KOLICHESTVA KISLORODA V ATMOSFERAKH PLANET SODERZHASCHIKH VODYANOY PAR]
E. K. Byutner Nov. 1963 9 p refs Transl. from Doklady Akad. Nauk SSSR, (Moscow), v. 138, no. 5, 1961 p 1050-1053
(NASA TT F-86) OTS: $0.50

A theoretical appraisal is made concerning whether the accumulation of a significant quantity of free oxygen in the terrestrial atmosphere as a result of water vapor photodissociation was possible prior to the appearance of organic life. This appraisal is made by estimating the time necessary for the accumulation of the given quantity of oxygen in the terrestrial atmosphere at the expense of H_2O photodissociation, with losses due to surface oxidation. Author

N64-10524 Weapons Research Establishment (Australia)
IONOSPHERIC DATA FOR OCTOBER 1962 FROM WOOMERA, SOUTH AUSTRALIA.
Aug. 1963 24 p
(Ionospheric Data Bull. CPD 1962/10(W))

Tables of the hourly values of the customary ionospheric parameters are given. Author

N64-10577 Joint Publications Research Service, Washington, D.C.
SOVIET STUDY OF ARBITRARY NORMAL SECTION OF ROTATION ELLIPSOID
V. N. Gan'shin Apr. 16, 1963 16 p refs Transl. into ENGLISH of an article from Izvest. Vyssh. Ucheb. Zaved., Geod. i Aerofotos., Moscow, no. 6, 1962 p 9-16
(JPRS-18704; OTS-63-21577) OTS: $0.50

The arbitrary normal section is defined as the section passing through two given points and normal in a certain third point. The resulting curve is a generalization of mutually perpendicular sections and a central curve. From investigation of this curve, the generalized formulas, the appropriate formulas for the direct and converse normal sections, and also for the central curve, are derived. Results indicate that the arbitrary normal section could be used successfully in the solution of major geodetic problems. R.T.K.

N64-10632 Joint Publications Research Service, Washington, D.C.
AERIAL PHOTO INTERPRETATION
Georgiy Valentinovich Gospodinov Feb. 21, 1963 170 p refs Transl. into ENGLISH of a book "Deshifrirovaniye Aerosnimkov" Moscow, Moscow U. Publishing House, 1961 186 p
(JPRS-17771; OTS-63-21189) OTS: $3.00

Major subject areas include: (1) basic photointerpretation factors, (2) general problems of photointerpretation, (3) methods of photointerpretation, (4) interpretation of social-geographic objects, and (5) interpretation of objects of the natural landscape. J.E.T.

N64-10634 Joint Publications Research Service, Washington, D.C.
MARINE GEOPHYSICAL EXPLORATION, USSR
N. I. Shapirovskiy and R. M. Gadchiyev Feb. 25, 1963 249 p 116 refs Transl. into ENGLISH of the book "Morskaya Geofizicheskaya Razvedka" Baku, 1962
(JPRS-17791; OTS-63-21193) OTS: $3.50

The book considers the significance of geophysical methods of exploration in the study of the geological structure of marine areas. A description is given of apparatus, methods, and techniques of observation in the conduct of seismographic surveying, gravimetric and electrical exploring operations, and sets forth the latest methods for determination of location of points at which geophysical observations are to be carried out. To show the effectiveness of the methods described, examples are given of complex geophysical surveys in the Caspian Sea. Author

N64-10639 Joint Publications Research Service, Washington, D.C.
AURORA BOREALIS
Yu. I. Gal'perin and A. I. Yershkov Mar. 22, 1963 47 p refs Transl. into ENGLISH of a pam. Znaniye Publishing House, 1963
(JPRS-18276; OTS-63-21383) OTS: $1.25

The many theories of the structure and composition of the polar aurora are summarized. The origin, altitude, spectra, intensity, frequency of appearance, number, form, and electric composition of the structures are also taken into account with the effect of the aurora on radio transmissions. D.E.R.

N64-10654 Joint Publications Research Service, Washington, D.C.
TOPOGRAPHIC MAPS, THEIR DEMAND AND USE IN THE NATIONAL ECONOMY
N. S. Podobodov May 22, 1963 28 p refs Transl. into ENGLISH of a Chapter of a book "Topograficheskoye Kartografirovaniye", Moscow, 1962 p 3-21
(JPRS-19321; OTS-63-21877) OTS: $0.75

Topics of discussion include: (1) features of the cartographic representation of a locality; (2) general principles in the organization of topographic operations; (3) documents regulating topographic work; and (4) requirements of certain branches of the national economy for topographic maps, with examples of their use for engineering purposes. J.E.T.

N64-10659 Joint Publications Research Service, Washington, D.C.
IMPROVING THE ORGANIZATION OF GEOLOGICAL INVESTIGATIONS
A. A. Gavrilov and A. S. Lavrikov June 18, 1963 12 p Transl. into ENGLISH of an article from Geodey. i Kartograf. (Moscow), Apr. 1963 p 38-42
(JPRS-19739; OTS 63-22073) OTS: $0.50

Topographic-geodetic and surveying work is divided into two groups on the basis of content and purpose as follows: (1) work on providing, in advance, for future geological investigations by means of a topographic and geodetic organization; (2) current handling of geological investigations by means of geodetic, topographic, and surveying data. Various suggestions are considered for the improvement of the organization of geological investigations. It is felt that the topographic-geodetic service in the geological organizations of the Ministry of Geology and Conservation of Natural Resources of the U.S.S.R. would be improved by such measures as employment of more highly skilled technicians. It is also suggested that, on the administrative level, positions should be created for topogeodetic groups or positions of chief (senior) specialists in topographic-geodetic work. R.T.K.

N64-10660 Joint Publications Research Service, Washington, D.C.
THE ATLANTIC OCEAN AND MODERN GEOPHYSICS

V. Shuleykin June 27, 1963 9 p refs Transl. into ENGLISH of an article from Nedelya (Moscow), no. 20, May 12–18, 1963 p 8–9
(JPRS-19896; OTS-63-31139) OTS: $0.50

The probable effects of the Atlantic Ocean on European climate and on the primary and secondary magnetic fields of the earth are discussed. J.E.T.

13 HEAT TRANSFER AND THERMODYNAMICS

Includes ablation; cooling; heating; and other thermal effects. *For aerothermodynamics see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 03 Aerodynamics of Wings, Rotors, and Control Surfaces. *For combustion see*: 26 Propellants and Combustion. *For related information see*: 11 Fluid Mechanics.

N64-10003 Syracuse U., N.Y.
PHYSIO-CHEMICAL FACTORS CONTRIBUTING TO THERMOELECTRIC PROPERTIES Progress Report, June 1962–Jan. 1963
G. Maxwell and D. V. Keller [1963] 17 p
(Contract Nonr-669(15))

The theoretical analysis of the thermoelectric properties of materials has been approached from either of two different standpoints: (1) irreversible thermodynamics or (2) from the kinetic theory through Boltzmann's equations. Both approaches are felt to lend a degree of understanding to the Thompson coefficient and its relation to metals and alloys. Therefore, a brief résumé of each approach is given. In the development of an experimental approach to the determination of the Thompson coefficient, the irreversible thermodynamical definition appeared to be the most valuable; however, the understanding of the entropy flow and its mechanism was felt to be more readily visualized through the kinetic attack and its relation to the electronic heat capacity. An apparatus was designed for Thompson coefficient determination and will be used to study the electrical and thermal properties of lead in order to set a standard for the apparatus. R.T.K.

N64-10033 European Atomic Energy Community, Brussels (Belgium)
I. DEMONSTRATION OF THE EXISTENCE OF A SOLUTION OF A SYSTEM OF INTEGRAL EQUATIONS ORIGINATING IN HEAT PROBLEMS II. DESCRIPTION OF A NUMERICAL METHOD SUITABLE FOR RESOLVING IT AND ITS APPLICATION IN THREE CASES OF INTEGRO-DIFFERENTIAL EQUATIONS REDUCIBLE TO THE PRECEDING SYSTEM [I. DIMOSTRAZIONE DELL' ESISTENZA DI UNA SOLUZIONE DI UN SISTEMA DI EQUAZIONI INTEGRALI PROVENIENTI DA PROBELM DEL CALORE II. DESCRIZIONE DI UN METODO NUMERICO ATTO A RISOLVERLO E SUA APPLICAZIONE IN TRE CASI DI EQUAZIONI INTEGRO-DIFFERENZIALI RIDUCIBILI AL SISTEMA PRECEDENTE]
Irene Gargantini Joint Nuclear Res. Center Ispra Estab. (Italy) Mar. 1963 14 p In ITALIAN; ENGLISH summary
(EUR 249.i; CETIS 59) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 25 Belg. Fr.

It is shown that there exists a solution of a system of two nonlinear integral equations, one with variable limits, the other with constant limits. The outline of demonstration is valuable also for a system of many Volterra equations and a Fredholm equation. The method of solution is a modified one of successive approximations, suitably adapted to the problem. Author

N64-10081* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
EXPERIMENTAL STUDIES OF STATIC STABILITY AND RADIATIVE HEATING ASSOCIATED WITH MARS AND VENUS ENTRY
Carlton S. James and Willard G. Smith *In* Am. Inst. of Aeron. and Astronautics Proc. of the Aerospace Forum I Session Jan. 1963 p 16–21 refs (See N64-10080 01-01) AIAA: $4.00 members, $8.00 nonmembers

Preliminary experimental studies concerning two aspects of vehicle entry into the atmosphere of Mars or Venus, those of radiative heating and static stability, are discussed. The radiative heating problem is examined by comparing gas-cap radiation in the simulated planetary atmospheres with that under the same ambient conditions in air. The effects of gas composition on static stability and drag of several different entry-body configurations are compared. Author

N64-10102* General Electric Co., Philadelphia, Pa. Space Sciences Lab.
MEASUREMENTS OF HYPERVELOCITY STAGNATION POINT HEAT TRANSFER IN SIMULATED PLANETARY ATMOSPHERES
J. S. Gruszczynski and W. R. Warren Mar. 1963 69 p refs
(NASA Contract NAS7-100; JPL Contract 950250; AF 49 (638)-931)
(NASA CR-52201; R63SD29) OTS: $6.60 ph, $2.27 mf

The heat transfer to the stagnation region of a hemispherical body at flight velocities up to 40,000 fps in two CO_2-N_2 gas mixtures corresponding to the expected atmosphere of Venus, has been investigated experimentally in the electrically driven hypervelocity shock tube. These results are compared with heat-transfer data in pure CO_2 and pure N_2. Calculations of radiative heat-transfer contribution to the total heating are shown. Also, shock-tube performance in two gas compositions as used in these experiments was computed. An attempt was made to measure radiant heat transfer to the stagnation region using the newly developed cavity gage. Author

N64-10315 Avco Corp., Wilmington, Mass. Research and Advanced Development Div.
CONVECTIVE HEATING IN PLANETARY ATMOSPHERES
W. Van Tassell Oct. 18, 1963 40 p refs
(RAD-TM-63-72)

A study of convective heating in mixtures of nitrogen and carbon dioxide is reported. This study for four different mixture ratios and for a variety of flight conditions has been performed. The results in the form of tables and design graphs are presented. Applications to planetary probe designs are given. A comparison with available experimental data is also made, and very good agreement is indicated. Author

N64-10358* National Aeronautics and Space Administration, Goddard Inst. for Space Studies, New York, N.Y.
INVESTIGATION OF PROBLEMS IN THERMAL CONVECTION
J. R. Herring Repr. from J. Atmospheric Sci., v. 20, no. 4, July 1963 p 325-338 refs
(NASA RP-66)

The thermal convection equations for a thin layer of fluid are solved numerically as an initial value problem. The calculations include only those nonlinear terms which have the form of

an interaction of a fluctuation in the velocity and temperature with the mean temperature field. In the present calculations, the velocity and temperature fluctuations have one horizontal wave number, and satisfy free boundary conditions on two conducting horizontal surfaces. The computed steady-state velocity and temperature amplitudes show many of the observed qualitative features. In particular, the experimentally observed boundary layering of the mean temperature field is correctly reproduced, and, at large Rayleigh number, the total heat transport is found to be proportional to the cube root of the Rayleigh number, provided the fluctuating temperature and velocity amplitudes have that horizontal wave number which maximizes the total heat transport. However, the heat transport found here for free boundaries is about three times the experimental value for rigid boundaries. The linear stability of the system is also investigated, and it is concluded that the stable solutions for all Rayleigh numbers investigated ($R > 10^6$) have horizontal wave numbers which very nearly maximize the total heat transport. Author

N64-10376 Atomic Energy of Canada Ltd., Chalk River, Ontario

THE THERMAL CONDUCTIVITY OF COLUMNAR GRAINS IN IRRADIATED UO_2 FUEL ELEMENTS (IRRADIATION TESTS X-225 AND X-227)

M. J. Notley July 1963 28 p refs

(AECL-1822; CRFD-1166) Available from Scientific Document Distribution Office, Atomic Energy of Canada Ltd., Chalk River, Ontario: $1.00

An irradiation experiment was performed to determine whether the columnar (essentially single-crystal) grains grown in UO_2 fuel elements under irradiation at high heat ratings showed an enhanced thermal conductivity. No indication was found of any alteration in thermal conductivity within the limits of error of the experiment. Although this does not exclude the possibility that enhanced conductivity can occur in uranium dioxide, it indicates that it is not necessarily a property of single-crystal material. Further information was obtained on the dependence of diametral expansions of Zircaloy-sheathed UO_2 fuel elements on heat rating, which confirms that the metallographic identification of the extent of central melting is substantially correct. Author

N64-10379 Atomic Energy of Canada Ltd., Chalk River, Ontario

SEMI-ANALYTIC CALCULATION OF THE TEMPERATURE DISTRIBUTION IN A PERFORATED CIRCLE

J. M. Kennedy and J. K. Fowler Sept. 1963 29 p

(AECL-1835; CRT-1170) Available from Scientific Document Distribution Office, Atomic Energy of Canada Ltd., Chalk River, Ontario: $1.00

The flow of heat in a tube-in-shell fuel element is closely related to the two-dimensional heat flow in a circular region perforated by a number of circular holes. Mathematical expressions for the two-dimensional temperature distribution have been obtained in terms of sources and sinks of increasing complexity located within the holes and beyond the outer circle. The report also describes a program known as TINS (Tube IN Shell) for the G-20 computer; this program solves the temperature problem for an array of one or two rings of holes, with or without a center hole. Author

N64-10455 Joint Publications Research Service, Washington, D.C.

PROBLEMS OF HIGH TEMPERATURE HEAT PHYSICS

V. A. Kirillin Apr. 2, 1963 Transl. into ENGLISH from Vestnik Akad. Nauk. SSSR (Moscow), no. 2, 1963 p 38–43

(JPRS-18497; OTS-63-21479) OTS: $0.50

Problems in the following four areas of high-temperature heat physics are discussed: (1) research into heat physical properties, heat transmission, and physicochemical processes in construction materials at high temperatures; (2) investigations into heat physical properties, heat transfer, and physicochemical processes in liquid metals and their vapors; (3) investigations into heat physical properties and heat transfer in gases at high temperatures; and (4) investigations into heat physical processes in high-temperature structures and apparatus. P.V.E.

N64-10523* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

TEMPERATURE MEASUREMENT OF HOT GAS STREAMS

Irving Fruchtman Repr. from AIAA Journal, v. 1, no. 8, 1963 (NASA RP-75)

An experimental method is presented with which the temperature of equilibrium, nonradiating, hot gas streams can be measured. The method, consisting of a small probe and companion equations, has been used to measure the temperature of the combustion products of the cyanogen-oxygen flame ($T \approx 7800°$ R) at 1 atm pressure; results are within 3% of spectrographic and microwave temperature determinations. Author

N64-10601* Smithsonian Institution Astrophysical Observatory, Cambridge, Mass.

ON THE DISTRIBUTION OF SURFACE HEAT FLOWS AND THE SECOND ORDER VARIATIONS IN THE EXTERNAL GRAVITATIONAL FIELD

Chi-Yuen Wang Sept. 12, 1963 16 p refs

(NASA Grant NsG-87-60)

(NASA CR-52496; SAO Special Rept.) OTS: $1.60 ph, $0.80 mf

The simplest explanation of the second order perturbations of the earth's gravitational field is the assumption that density anomalies of small magnitude exist in the interior of the earth. Here an explanation for such perturbations is sought based on the distribution of heat flows over the surface of the earth. A correlation is found to exist between high heat flow and low gravity, and their opposites. These sets of data are interpreted using the convection current hypothesis concluding that, the material under the depressed geoid (gravitational equipotential surface) may be lighter and hotter, but motions are not necessarily indicated. The phenomena may be explained by thermal convections in the mantle with ascending currents in the mantle-carrying lighter material and bringing heat to the top of the mantle. This creates high surface heat flow over the ascending currents and lowers the surrounding gravity. D.E.R.

N64-10615 Atomic Energy of Canada Ltd., Chalk River, Ontario

THE EFFECT OF OXYGEN: URANIUM RATIO ON THE THERMAL CONDUCTIVITY OF URANIUM OXIDE DURING IRRADIATION IN PELLET ROD MARK V

R. C. Hawkings and A. S. Bain May 1963 68 p refs

(CRDC-1153; AECL-1790)

Three aluminum-sheathed uranium-oxide-fueled cartridges were irradiated one above the other in the NRX reactor. The top and bottom cartridges contained $UO_{2.0}$, while the center one contained $UO_{2.19}$. Temperatures up to 1475°C were recorded by thermocouples in the $UO_{2.0}$. The thermocouple in the $UO_{2.19}$ failed early in the irradiation after recording a temperature of ~500°C. During the first irradiation cycle the thermal conductivity of the $UO_{2.0}$ was 0.055 W/cm°C at 300°C and 0.045 W/cm°C at 500°C; over the same temperature

range the conductivity of the $UO_{2.19}$ was about 0.028 W/cm° C. The low-temperature (300° C) conductivity of the $UO_{2.0}$ decreased with increased irradiation, whereas the conductivity of $UO_{2.0}$ at higher temperature (700° C) was essentially the same as that for unirradiated material, to an irradiation of 10^{19} fissions/cm^3. Author

14 HUMAN BEHAVIOR

Includes crew training and evaluation; piloting; and psychological factors. *For simulators see*: 10 Facilities, Research and Support. *For related information see*: 16 Life Sciences.

N64-10147 Technische Hochschule Darmstadt (W. Germany) Inst. fur Flugtechnik

THE STATE-OF-THE-ART OF PILOT CONTROL OF AIRCRAFT [OBER DEN WISSENSSTAND AUF DEM FORSCHUNGSGEBIET DES "REGLER MENSCH"]

Hubertus Schmidtlein [1963] 56 p 82 refs In GERMAN Presented at the Ann. Meeting of the Wiss. Ge. Luft- und Raumfahrt, Munich, Oct. 8–12, 1963

Results of an extensive literature search indicate that the investigation of humans as controllers in a pilot–aircraft system is a very complex problem. In determining the human frequency response characteristics, two difficulties are encountered. The first lies in the fact that it is possible for a human to adapt his control attitude in a stepwise manner. The second difficulty is that the control attitude of the human is not linear and that it varies appreciably with time. The frequency-response characteristics of the pilot can, therefore, only be approximated. Thus, limitations of the use of a "formula-like" correlation for the frequency response characteristics is indicated. An extensive annotated bibliography relating to human engineering is presented. I.v.L.

N64-10208 Joint Publications Research Service, Washington, D.C.

SOME ASPECTS OF SOVIET TRAINING FOR SPACE FLIGHT

Nov. 12, 1963 20 p refs Transl. of series of articles from Sov. Kirgiziya (Frunze), Aug. 6–9, 1963 p 4
(JPSR-21829; OTS-63-41121) OTS: $0.50

This report contains notes of one of the trainers who prepared the cosmonauts for spaceflight. Vestibulary, centrifuge, and thermal-chamber tests are discussed. The training of Valentina is also discussed. I.v.L.

N64-10383 Joint Publications Research Service, Washington, D.C.

SOVIET STUDIES ON REACTIONS TO ACCELERATION

N. I. Arlashchenko, B. B. Bokhov, V. Ye. Busygin, N. A. Volokhova, Yu. G. Grigor'yev et al Nov. 19, 1963 17 p refs Transl. into ENGLISH of two articles from Byull. Ekspt. Biol. i Med. (Moscow), v. 56, no. 8, Aug. 1963 p 28–37
(JPRS-21908; OTS-63-41158) OTS: $0.50

Two studies on reactions to acceleration are presented. In the first study, the reactions of people in a slowly rotating chamber (MVK-1), the first Soviet apparatus for studying the body reaction to the long-term effect of Coriolis accelerations, were investigated. No significant changes in the thresholds of the sensory and somatic reflexes under investigation were noted; however, changes were found in skin temperature, and more distinct disorders were observed in coordination. In the second study, an inquiry was made into the chief indices of external respiration in man during the action of accelerations (up to 15 g) directed along the dorso-thoracic axis at an angle of 65° to the longitudinal axis of the human body. A definite regularity was established in the changes of the indices studied with various accelerations. Definite stages were noted in the development of individual reactions; this regularity reflected the essence of the general biological laws concerning body adaptation to new environmental conditions. R.T.K.

N64-10385 Joint Publications Research Service, Washington, D.C.

THE APPLICATION OF REFLEXOMETRIC AND TREMOMETRIC METHODS IN OCCUPATIONAL PSYCHOLOGY

G. Gereb Nov. 21, 1963 15 p refs Transl. into ENGLISH from Voprosy Psikhologii (Moscow), no. 4, 1963 p 135–142
(JPRS-21974; OTS-63-41189) OTS: $0.50

The dynamics of the condition of fatigue during the work week were investigated. The data were collected with the aid of special instruments, the reflexometer and the tremometer, designed to measure the time of a motor reaction and the amount of finger tremor, respectively. Correlation between the values obtained by using both apparatus and methods of investigation are reported; and curves which reflect the course of the development of fatigue as a function of time are presented. Results indicate that data can be obtained for determining the specific conditions and degree of fatigue by applying the methods described. R.T.K.

N64-10432 Federal Aviation Agency Oklahoma City, Okla. Civil Aero-medical Research Inst.

ANNOTATED BIBLIOGRAPHY OF RECENTLY TRANSLATED MATERIAL. I. Technical Publication No. I

William E. Collins, Jerry V. Tobias, Mary Jane Capps, and Mary Ellen Allen, Comp. Aug. 1963 11 p 26 refs

An annotated bibliography of translations of foreign-language research articles is presented. The 26 listed entries are concerned with studies of voluntary nystagmus, vestibular nystagmus, EEG and vestibular stimulation, and effects of coriolis accelerations. Author

N64-10444 Human Sciences Research, Inc., Arlington, Va.

LABORATORY STUDIES OF THE ABILITY OF OBSERVERS TO PERFORM THREE VISUAL TASKS REQUIRED OF PILOTS IN APPROACH AND LANDING

W. S. Vaughn, Jr., Wallace F. Rollins, and Terrence S. Luce Apr. 1963 111 p refs
(Contract FAA/BRD-401)
(HSR-RR-63/7-MK-X)

CONTENTS:

1. LABORATORY STUDIES OF THE ABILITY OF OBSERVERS TO PERFORM THREE VISUAL TASKS REQUIRED OF PILOTS IN APPROACH AND LANDING Final Report W. S. Vaughan, Jr., W. F. Rollins, and T. S. Luce 25 p refs (See N64-10445 01-14)

2. ABILITY OF OBSERVERS TO ADJUST GEOMETRIC FORMS AND LINEAR STIMULI TO VARIOUS SLANT ANGLES (APPENDIX A) N. W. Weissman, R. G. Kassebaum, and W. S. Vaughan, Jr. 28 p refs (See N64-10446 01-14)

3. ABILITY OF OBSERVERS TO ALIGN WITH LINEAR STIMULI (APPENDIX B) T. S. Luce, R. G. Kassebaum, and W. S. Vaughan, Jr. 30 p refs (See N64-10447 01-14)

4. ABILITY OF OBSERVERS TO ADJUST LINEAR STIMULI TO A HORIZONTAL ORIENTATION (APPENDIX C) W. F. Rollins and W. S. Vaughan, Jr. 32 p ref (See N64-10448 01-14)

N64-10445 Human Sciences Research, Inc., Arlington, Va.
LABORATORY STUDIES OF THE ABILITY OF OBSERVERS TO PERFORM THREE VISUAL TASKS REQUIRED OF PILOTS IN APPROACH AND LANDING Final Report
W. S. Vaughan, Jr., Wallace F. Rollins, and Terrence S. Luce *In its* Lab. Studies of the Ability of Observers to Perform 3 Visual Tasks Required of Pilots in Approach and Landing Apr. 1963 25 p refs (See N64-10444 01-14)

A series of laboratory studies was conducted to describe the ability of adult human subjects to perform visual tasks representative of those performed by pilots during final approach and landing. Ability to perform visual tasks was related to variations in lighting design parameters. Results of these studies can be used as preliminary design guides for airport and heliport lighting systems. Author

N64-10446 Human Sciences Research, Inc., Arlington, Va.
ABILITY OF OBSERVERS TO ADJUST GEOMETRIC FORMS AND LINEAR STIMULI TO VARIOUS SLANT ANGLES (APPENDIX A)
N. W. Weissman, R. G. Kassebaum, and W. S. Vaughan, Jr. May 1962 *In its* Lab. Studies of the Ability of Observers to Perform 3 Visual Tasks Required of Pilots in Approach and Landing Apr. 1963 28 p refs (See N64-10444 01-14)
(HSR-RR-61/13-MK-X)

Two experiments were conducted to determine if any of six basic geometric designs (square, triangle, hexagon, circle, trapezoid, and rectangle) yield differential information regarding angular change. No significant differences were found. As a consequence, a third experiment was conducted to study subject sensitivity to angular change on the basis of the distance between elements (points) of top and bottom borders. The results of this experiment suggest that separations between the two point sources of 9 to 49 minutes of visual angle yield most accurate judgments of slant. Separations between point sources of less than 9, or greater than 49, yield less accuracy in estimating slant. Author

N64-10447 Human Sciences Research, Inc., Arlington, Va.
ABILITY OF OBSERVERS TO ALIGN WITH LINEAR STIMULI (APPENDIX B)
Terrence S. Luce, R. G. Kassebaum, and W. S. Vaughan, Jr. Dec. 1962 *In its* Lab. Studies of the Ability of Observers to Perform 3 Visual Tasks Required of Pilots in Approach and Landing Apr. 1963 30 p refs (See N64-10444 01-14)
(HSR-RR-62/9-MK-X)

In the first experiment, two point sources of illumination separated by a range of distances were used as stimuli, and the subject's task was to align himself with the directional orientation of the pair of "dots." In the second experiment, solid lines of different lengths were used as stimuli and the subject's task was to align himself with the directional orientation of the line. Both experiments were conducted in a completely darkened room with the stimuli illuminated by an ultraviolet light. Results indicate that ability to align oneself with a line or with an imaginary line defined by two dots is a monotonic function of the length of the line and of the degree of separation between the two dots. Variability of alignment responses decreased sharply as the separation between dots was increased from 2.7 to 9.1 minutes of visual angle. A sharp decrease in variability of alignment performance accompanied an increase in the length of line from 2.7 to 18.1 minutes of visual angle. Author

N64-10448 Human Sciences Research, Inc., Arlington, Va.
ABILITY OF OBSERVERS TO ADJUST LINEAR STIMULI TO A HORIZONTAL ORIENTATION (APPENDIX C)
Wallace F. Rollins and W. S. Vaughan, Jr. Feb. 1963 *In its* Lab. Studies of the Ability of Observers to Perform 3 Visual Tasks Required of Pilots in Approach and Landing Apr. 1963 32 p ref (See N64-10444 01-14)
(HSR-RR-63/2-MK-X)

Two laboratory experiments were conducted to assess human performance in adjusting linear stimuli to a horizontal position. In the first experiment, solid lines of various lengths were used as stimuli and, in the second experiment, the stimuli were pairs of "dots" separated by various intervals. In both studies the subject's task was to adjust the stimulus to a horizontal position. The experiments were conducted in a completely darkened room with the stimuli illuminated by an ultraviolet light. Results indicate that ability to adjust linear stimuli to the horizontal is a function of stimulus extent. Response variability decreased as line length increased to 132.6 minutes of visual angle. Variability increased, then decreased again to its former level when longer line stimuli were presented. As the separation between dots increased, variability decreased to a minimum at a separation of 221.4 minutes of visual angle. When the separation was increased beyond this point, variability increased significantly. Author

N64-10505 Joint Publications Research Service, Washington, D.C.
SOVIET BOOK ON HUMAN ENGINEERING, OUTLINE
Orest Aleksandrovich Sidorov Apr. 18, 1963 17 p refs Transl. into ENGLISH of the foreword, introd., and table of contents of book "Fiziologicheskiye Faktory Cheloveka Opredelyayushchiye Komponovku Posta Upravleniya Mashinoy," Moscow, State Sci.—Tech. Pub. House for the Dept. of Defense, 1962 p 3–12 and 360–363
(JPRS-18772; OTS-63-21607) OTS: $0.50

An attempt was made to systemize and generalize assorted data on the physiology, psychology, and hygiene of human labor, mainly as it is involved in the operation of machinery. A brief survey is given of the basic questions of anatomy, physiology, and psychology, along with general and well-verified data from literature and practice on designing control equipment for machinery. Practical methods are cited for designing the control site for different types of machinery and installations and for drawing up standard plans, and principal recommendations are developed for protecting the normal health of the operator under various environmental conditions (sanitary conditions); the physiological and psychological effects of such conditions on man are shown. C.L.W.

N64-10506 Joint Publications Research Service, Washington, D.C.
THE MODELING OF THOUGHT PROCESSES
V. M. Glushkov Apr. 24, 1963 21 p refs Transl. into ENGLISH from Priroda (Moscow), no. 2, 1963 p 3–13
(JPRS-18873; OTS-63-21662) OTS: $0.50

In discussing the modeling of thought processes, the following areas are discussed: (1) a model of the brain, (2) algorithms and coding, (3) possibility of automating scientific creativity, (4) modeling of processes for discrimination of forms, and (5) testing of machine instructions. P.V.E.

N64-10526 Rome Air Development Center, Griffiss AFB, N.Y.
PROCEEDINGS OF SYMPOSIUM ON HUMAN FACTOR ASPECTS OF PHOTO INTERPRETATION [NOV. 7-8, 1962]
Sept. 1963 143 p refs
(RADC-TDR-63-324; AD-422432)

01-14 HUMAN BEHAVIOR

CONTENTS:

1. THE AUTOMATION OF PHOTO INTERPRETER FUNCTIONS L. D. Sinnamon, Jr. p 3-4 (See N64-10527 01-14)

2. HUMAN FACTOR PROBLEMS: OBJECTIVES AND APPROACHES S. Mac Leod p 5-7 (See N64-10528 01-14)

3. MEASUREMENT AND EVALUATION OF GROUND RESOLUTION R. N. Cook and F. B. Meeker (Minneapolis-Honeywell Regulator Co.) p 9-25 (See N64-10529 01-14)

4. QUALITY CATEGORIZATION OF AERIAL PHOTOGRAPHY P. G. Roetling (Cornell Aeron. Lab., Inc.) p 26-41 (See N64-10530 01-14)

5. PSYCHOPHYSICAL ASPECTS OF IMAGE QUALITY R. Sadacca and A. I. Schwartz (Army Personnel Res. Office) p 42-52 (See N64-10531 01-14)

6. A STUDY OF IMAGE QUALITIES AND SPEEDED INTRINSIC TARGET RECOGNITION S. H. Winterstein (IBM Corp.) p 53-59 ref (See N64-10532 01-14)

7. FACTORS AFFECTING CHANGE DISCRIMINATION C. Kraft and C. L. Klingberg p 61-85 (See N64-10533 01-14)

8. RESEARCH ON THE RELATIONSHIP BETWEEN TIME AND PI PERFORMANCE E. I. Chalmers and H. D. Lerner (Appl. Psychology Corp.) p 87-108 (See N64-10534 01-14)

9. APPLICATION OF RAPID PRESENTATION TECHNIQUES IN PHOTO INTERPRETATION R. L. Krumm, R. E. Graves, and A. J. Farina (RCA) p 109-121 refs (See N64-10535 01-14)

10. PHOTO INTERPRETATION COURSES TAUGHT AT SHEPPARD AFB, TEXAS R. E. Millspaugh (Tech. Training School (3750th)) p 123-126 (See N64-10536 01-14)

11. OTHER HUMAN FACTORS PROBLEM AREAS REQUIRING STUDY S. Mac Leod p 127-128

N64-10527 Rome Air Development Center, Griffiss AFB, N.Y.

THE AUTOMATION OF PHOTO INTERPRETER FUNCTIONS

Lynwood D. Sinnamon, Jr. *In its* Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7-8, 1962] Sept. 1963 p 3-4 (See N64-10526 01-14)

Background information is presented regarding the contribution of automation to photo interpretation. Projects in optical processing, enhancement, textural analysis, etc., are discussed. Author

N64-10528 Rome Air Development Center, Griffiss AFB, N.Y.

HUMAN FACTOR PROBLEMS: OBJECTIVES AND APPROACHES

Shelton Mac Leod *In its* Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7-8, 1962] Sept. 1963 p 5-7 (See N64-10526 01-14)

Several key human factor problems in photo interpretation are depicted, along with required objectives and approaches. The need for an optimal integration of man and machine phases of the interpretation process is discussed with reference to four major classes of research toward more efficient interpreter performance. Specific criteria of realism and applicability are discussed. Author

N64-10529 Minneapolis-Honeywell Regulator Co., Duarte, Calif.

MEASUREMENT AND EVALUATION OF GROUND RESOLUTION

Robert N. Cook and Fred B. Meeker *In* Rome Air Develop. Center, Griffiss AFB, N.Y. Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7-8, 1962] Sept. 1963 p 9-25 (See N64-10526 01-14)

A study is described which will undertake the analysis of photo interpretation performance as a function of photographic ground resolution and contrast. Interpreter performance is to be measured in terms of accuracy, speed, and features used in identification. Twenty-nine types of targets are to be investigated in both real and simulated aerial photography. Results of the study should facilitate prediction of minimum levels of PI performance for photos having a given image quality. Concerning reconnaissance mission planning, the results will show what ground resolution and contrast (neglecting grain effects) are necessary to provide X level of accuracy and Y level of speed in target identification. Author

N64-10530 Cornell Aeronautical Lab., Buffalo, N.Y.

QUALITY CATEGORIZATION OF AERIAL PHOTOGRAPHY

Paul G. Roetling *In* Rome Air Develop. Center, Griffiss AFB, N.Y. Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7-8, 1962] Sept. 1963 p 26-41 (See N64-10526 01-14)

A study is in progress to determine a "summary measure" of image quality. The measure will relate physically measurable quantities in the image to photo interpreter performance. A program is described in which real aerial photography is selected and photographically modified to achieve a range of "qualities." These modified photographs are then used in a series of tests in which photo interpreters perform realistic interpretation tasks. The results of the tests will be used to derive a summary measure of image quality. Author

N64-10531 Army Personnel Research Office, Washington, D.C.

PSCHOPHYSICAL ASPECTS OF IMAGE QUALITY

Robert Sadacca and Alfred I. Schwartz *In* Rome Air Develop. Center, Griffiss AFB, N.Y. Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7-8, 1962] Sept. 1963 p 42-52 ref (See N64-10526 01-14)

A study is being made to evaluate relationships between psychophysical judgments of image quality and physical image variables. Relationships will also be established between their judgments and actual interpreter performance. The general hypothesis is that viewers are able to judge efficiently the overall quality of imagery, and thereby shortcut the need in the Army tactical setting for measurement devices and the application of weighting formulas in assessing image quality. Author

N64-10532 International Business Machines Corp., Owego, N.Y.

A STUDY OF IMAGE QUALITIES AND SPEEDED INTRINSIC TARGET RECOGNITION

Samuel H. Winterstein *In* Rome Air Develop. Center, Griffiss AFB, N.Y. Proc. of Symp. On Human Factor Aspects of Photo Interpretation [Nov. 7-8, 1962] Sept. 1963 p 53-59 ref (See N64-10526 01-14)

A brief summary is presented of an experimental Image Quality Independent Research and Development program designed to determine the relationships between image quality and military target recognition performance. An explanation is given of the methodology employed and the investigations conducted during the program. The major results are described and the present status of the effort is indicated. Author

N64-10533 Boeing Co., Seattle, Wash.

FACTORS AFFECTING CHANGE DISCRIMINATION

Conrad Kraft and C. L. Klingberg *In* Rome Air Develop. Center, Griffiss AFB, N.Y. Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7-8, 1962] Sept. 1963 p 61-85 (See N64-10526 01-14)

A background research program is described which is relevant to current research on photographic change discrimination. The objectives of the present investigation are to determine the effects of selected presentation variables on the detection and identification of changes in comparative-cover photo pairs. In particular, the relative advantages of a side-by-side versus an apparent motion mode of display is being investigated. A detailed description of the research design is presented and preliminary findings are described. Author

N64-10534 Applied Psychology Corp., Arlington, Va.
RESEARCH ON THE RELATIONSHIP BETWEEN TIME AND PI PERFORMANCE
E. L. Chalmers and H. D. Lerner *In* Rome Air Develop. Center, Griffiss AFB, N.Y. Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7–8, 1962] Sept. 1963 p 87–108 (See N64-10526 01-14)

The present research program is concerned with the development of improved techniques related to temporal aspects of photo interpretation. Two primary variables (exposure time and work–rest cycles) will be studied independently, together with five secondary variables (scale, resolution, contrast, target density, and target detail). Anticipated research results will have implications for inflight interpretation, optimum work output, effective duty cycles, and training and man–machine assignments. Author

N64-10535 Radio Corp. of America, Bethesda, Md.
APPLICATION OF RAPID PRESENTATION TECHNIQUES IN PHOTO INTERPRETATION
R. L. Krumm, R. E. Graves, and A. J. Farina *In* Rome Air Develop. Center, Griffiss AFB, N.Y. Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7–8, 1962] Sept. 1963 p 109–121 refs (See N64-10526 01-14)

A research program is described which attempts to develop and evaluate rapid recognition techniques for the purpose of increasing the speed with which interpreters can perform flash or real-time identification of high priority targets and data from sensor recordings. It is anticipated that optimal techniques may be a function of such image quality parameters as scale resolution, contrast and complexity as well as the target signature, per se. Target signatures, having a functional relationship to the target, are being developed with consideration for several variables. The research design includes repeated presentations of stimulus material at decreasing exposure rates and under conditions involving differential reinforcement. Author

N64-10536 Technical Training School (3750th), Sheppard AFB, Tex. Dept. of Intelligence Training
PHOTO INTERPRETATION COURSES TAUGHT AT SHEPPARD AFB, TEXAS
Robert E. Millspaugh *In* Rome Air Develop. Center, Griffiss AFB, N.Y. Proc. of Symp. on Human Factor Aspects of Photo Interpretation [Nov. 7–8, 1962] Sept. 1963 p 123–126 (See N64-10526 01-14)

Intelligence photo-radar training courses for USAF officers and airmen are presented. The main course is outlined and some remarks relative to the selection and testing of students are made. Author

N64-10553 Michigan U., Ann Arbor Inst. of Science and Tech.
IMPLICATIONS OF SHORT-TERM MEMORY FOR A GENERAL THEORY OF MEMORY Memorandum of Project Michigan
Arthur W. Melton Oct. 1963 39 p refs
(Contract DA-36-039-SC-78801)
(Rept. 2900-410-R; AD-422425)

A number of current issues in learning theory are restated as issues about the formation, storage, and retrieval of memory traces, and the major issue is identified as the question whether short-term memory and long-term memory are points on a continuum, or a dichotomy. Then this major issue is examined in the light of data from recent studies in which the recall of single to-be-remembered alphanumeric items followed a single or very few repetitions. Finally, the issue is examined in the light of new data that relate the slope of the short-term forgetting curve to the number of elements or recoded "chunks" in the to-be-remembered unit. Also new data are presented that confirm and extend Hebb's finding that there is a specific accumulative strengthening effect of repetitions in the "immediate" memory situation involving to-be-remembered units beyond the span of immediate memory of human subjects. It is concluded that a continuum, rather than a dichotomy, is involved in short-term and long-term memory. Author

N64-10592 Joint Publications Research Service, Washington, D.C.
TRAINING RADIO ENGINEERS
I. G. Klyatskin and Ye. P. Dement'yev July 2, 1963 13 p Transl. into ENGLISH of 2 articles from Radio Tekhnika (Moscow), v. 18, no. 5, May 1963 p 66–71
(JPRS-19999; OTS-63-31189) OTS: $0.50

The first stage in training radio engineers should be theoretical training in the following areas: (1) linear electronic circuits; (2) fundamentals of radioelectronics; (3) technical electrodynamics; and (4) electronic systems. The second stage of training should be the radio engineering courses. The principal purpose of these courses should be the designing of installations with direct simulation. The laboratory study held in conjunction with these courses should have the character of either industrial assignments (for example, testing of equipment), or creative work. In general these courses should train the student for independent work. Also, ways and means of improving the training of radio engineers is discussed. I.v.L.

15 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gauges; sensors and transducers; and telescopes and cameras. *For related information see*: 06 Auxiliary Systems; 08 Communications; 09 Electronics; and 22 Navigation and Guidance.

N64-10097* Texaco Experiment Inc., Richmond, Va.
SURVEYOR GEOPHYSICAL INSTRUMENT, VOLUME I: SURFACE GEOPHYSICAL INSTRUMENT—PROTOTYPE NO. 1 Interim Report
R. E. Canup, R. H. Clinard, Jr., V. M. Barnes, Jr., J. R. Bond, R. P. Doelling et al May 1, 1962 229 p refs
(Contract JPL-95015)
(NASA CR-52133; TP-192; EXP 387) OTS: $15.00 ph, $7.07 mf

The instruments included are designed to measure temperature, thermal diffusivity, magnetic susceptibility, density, penetrability, and acoustic velocity of the lunar surface. For each instrument, a system and equipment description, report

of testing and calibration, components outline, description of packaging philosophy, theoretical studies, and environmental test results, and a recommendations section are included.
Author

N64-10195 Joint Publications Research Service, Washington, D.C.
NEW DEVELOPMENTS IN PHOTOTACHYMETRY EQUIPMENT
G. A. Fel'dman Oct. 18, 1963 9 p refs Transl. into ENGLISH from Geod. i Kartograf. (Moscow), no. 8, Aug. 1963 p 62-66
(JPRS-21509; OTS-63-31966) OTS: $0.50

Recent developments in phototachymetry equipment are in the area of developing instruments for measuring, with maximum accuracy, comparatively short distances (from 200 meters to 5 kilometers) under day and night conditions. Rangefinders which work on three fixed frequencies, lying in the frequency range of 30 megacycles per second, are presently available. For the development of modulators of luminous flux which operate at frequencies of more than hundreds of megacycles per second, use can be made of the Kerr effect in a solid dielectric. The original tachymeter device (a mecometer) used a similar-type modulator; however, the accuracy of the mecometer cannot be fully utilized because of insufficient accuracy in the presently accepted value for the speed of light. Attempts to develop an experimental tachymeter system using lasers have been carried out, using systems analogous with the pulse-radar systems. It is indicated, however, that it is not possible to modulate the light beam of a laser with a pulse method.
P.V.E.

N64-10224 Weapons Research Establishment (Australia)
A SEARCH AND DISPLAY UNIT FOR THE TIM TIMING CODES (TYPE 2)
B. Lowe and P. E. Burnard Aug. 1963 34 p refs
(Tech. Note PAD-73)

This note describes equipment which has been designed to mark the occurrence of any particular minutes and seconds code group in the TIM 10, TIM 100 or TIM 1,000 codes, particularly when these codes are read from magnetic tape. The minutes and seconds groups are continuously sampled, and various outputs are produced when the sampled code coincides with the setting of switches on the equipment. Edge-lit indicators provide a running decimal display of minutes and seconds as each code is sampled.
Author

N64-10255 Cutler-Hammer, Inc., Deer Park, N.Y. Airborne Instruments Lab.
ASDE BRIGHT-DISPLAY STUDY Final Report
June 1963 51 p refs
(Contract FA-WA-4149)

The object of this study has been to determine the optimum display technique to permit high-resolution radar information to be viewed in the daytime environment of airport tower cabs. The results of this study indicate that television scan-conversion techniques and direct-view storage tubes are applicable to the design of a bright ASDE display. The recommended configuration for such a system would use the existing ASDE-2 display consoles, modified to accommodate a high-resolution television camera for direct pickup of the PPI presentation on a 5-inch flat-face CRT. Displays in the tower cab would be bright television monitors, using the FAA 945-line TV standard. With this system, the objective for 20-foot, effective system range resolution can be achieved for airport coverage up to 9000 × 12,000 feet.
Author

N64-10361* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TWO-COMPONENT MICROBALANCE FOR MEASURING THE FORCES ON ION-BOMBARDED SURFACES
Vernon L. Rogallo and Howard F. Savage Repr. from Rev. Sci. Instr., v. 34, no. 9, Sept. 1963 p 988-991

A two-component null-type microbalance has been developed to measure forces due to ion bombardment on a surface. The balance employs the principle of the attracted disk electrometer. The sensitivity can be adjusted by simply changing the location of the center of gravity. Measurements of a few micrograms of force in two perpendicular directions can be made simultaneously.
Author

N64-10397 California U., Berkeley. Lawrence Radiation Lab.
A COMPARISON OF THE GAMMA ENERGY RESPONSE OF A PORTABLE SCINTILLOMETER WITH THAT OF AN IONIZATION CHAMBER
Francis M. Miller Aug. 22, 1963 32 p refs
(Contract W-7405-eng-48)
(UCRL-10986) OTS: $0.75

A study of fallout and natural background radiation in the San Francisco Bay area is presented. Portable scintillometers are used to gather data. The gamma-ray response of the scintillometers is compared with the response of an integrating ion chamber over an energy range of approximately 1.5 Mev starting at 0.12 Mev. The results verify the theoretical assumption that the scintillometer response is proportional to the number of γ-ray photons, whereas the ion-chamber response is a measure of the dose, i.e., proportional to the energy of the γ rays as well as to the quantity of the incident gammas. Additional results also demonstrate the validity of using a radium source for calibration of the instruments used for natural background measurements.
Author

N64-10411 Weapons Research Establishment (Australia)
AN INSTRUMENT FOR THE MEASUREMENT OF LOW CONCENTRATIONS OF HYDROCARBONS AND CARBON DIOXIDE IN GASES
I. M. Napier Aug. 1963 17 p refs
(WRE-TN-CPD-63)

An instrument is described for measuring concentrations less than 3 ppm of carbon dioxide in air or nitrogen. The instrument can be used in conjunction with a copper oxide furnace (also described) to measure hydrocarbon concentrations in gas streams in an air separation plant.
Author

N64-10466* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
AN INTEGRATED HOT WIRE-STILLWELL LIQUID LEVEL SENSOR SYSTEM FOR LIQUID HYDROGEN AND OTHER CRYOGENIC FLUIDS
William A. Olsen, Jr., Washington, NASA, Nov. 1963 33 p refs
(NASA TN D-2074) OTS: $1.00

A hot-wire-stillwell liquid-level sensor system was developed for general use as a liquid-level sensor for cryogenic fluids. Results of an analytical and experimental study showed that the device possesses a fast time response and is sufficiently accurate, rugged, and electronically simple for both filling and outflow applications. It is not subject to the cool-down problem of most level sensors. Information and recommendations are provided for the design of hot wire rakes and stillwells for cryogenic applications.
Author

N64-10496 Joint Publications Research Service, Washington, D.C.

THEORY OF MICHAELSON'S STELLAR INTERFEROMETER

I. L. Bershteyn, et al Mar. 13, 1963 10 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR, (Moscow), v. 86, no. 1, 1952 p 47–50

(JPRS-18083; OTS-63-21303) OTS: $0.50

The Michaelson stellar interferometer permits the measurement of the angular diameter, ψ, of a star by means of observing the variation V (S, ψ), in visibility of the interference pattern as a function of distance s between the mirrors of the base. Michaelson considered that for a measurement of a source's dimension, it was necessary to have a base assuring the disappearance of the interference fringes, i.e., s must be greater than $1.22\ \lambda/\psi$, where λ is the wavelength. In the present investigation, the following were demonstrated: (1) the atmospheric and mechanical perturbations do not set the limit to the increase in the length of the base in a stellar interferometer; and (2) at a base length of s, it is possible to measure, with the aid of a stellar interferometer, the stars' angular diameters that are considerably smaller than λ/s. R.T.K.

N64-10594 Joint Publications Research Service, Washington, D.C.

IMPROVING MODERN APPARATUSES FOR PROLONGED ARTIFICIAL RESPIRATION

V. P. Doroshchuk Aug. 15, 1963 13 p refs Transl. into ENGLISH of an article from Vestn. Khirurg., v. 90, no. 3, Mar. 1963 p 81–87

(JPRS 20662; OTS 63-31541) OTS: $0.50

The requirements for an "ideal respirator" are that it (1) be suitable for all age groups; (2) have the ability to create adequate pressure gradients in the respiratory tract; (3) have the ability to create brief elevations of pressure to 30 or 40 cm of water in the tract; (4) have safety regulators; (5) have frequency regulators; (6) be compatible with different gas mixtures, as well as pure oxygen; (7) filter or purify the gases admitted to the lungs; (8) regulate the dosage of air; (9) provide the lungs with 1 to 30 liters of gas/minute; (10) humidify and warm gases; (11) control the level of CO_2 in alveolar air, and have an oxyhemograph; (12) combine a respirator, a coughing device, an aerosol inhalator, and a suction device; (13) vary the phases of the respiratory cycle; (14) can accomplish respiration through a tracheostomy tube, face mask, or nasal catheter; (15) be easy to operate, and not affect bed posture; (16) be portable, quiet in operation, and safe; (17) signal a malfunction; and (18) have the least negative psychological effect on the patient possible. D.E.R.

16 LIFE SCIENCES

Includes biology; exobiology; physiology; medicine; life support systems; radiation effects on biological systems; and space sickness. *For related information see*: 14 Human Behavior; and 28 Space Radiation.

N64-10002 Joint Publications Research Service, Washington, D.C.

PHYSIOLOGY OF THE BLOOD OF HUMANS AND ANIMALS IN HOT CLIMATES, USSR

A. Yu. Yunosov Oct. 10, 1963 11 p Transl. into ENGLISH of Conclusions and Deductions, Chapter 7, and Table of Contents of "Fiziologiya Krovi Cheloveka i Zhivotnykh v Zharkom Klimate" (Physiology of Human and Animal Blood in Hot Climates), Tashkent, Uzbek SSR, 1961

(JPRS-21405; OTS-63-31914) OTS: $0.50

The effect of high temperatures on the composition and properties of blood has been investigated, and the changes associated with seasonal temperature rises and with abrupt, multiple exposures to high temperature are summarized. Three phases occur in response to prolonged exposure to high temperature: (1) a thinning of the blood characterized by increased water content, a reduction in erythrocyte and hemoglobin content, and an increase in the volume of individual erythrocytes; (2) thickening of the blood characterized by reduced water content, and increases in density, erythrocyte count, and hemoglobin; and (3) a gradual return to initial levels. These adaptive thermoregulatory changes are accomplished primarily by the cerebral cortex. Cortical function is even more evident in the seasonal adaptation to environmental changes. Further experimental evidence for neural control is presented, including blood changes resulting from spinal-cord section, decortication of one cerebral hemisphere, and decortication of both hemispheres or drug inhibition of cortical function. M.P.G.

N64-10006 Joint Publications Research Service, Washington, D.C.

VARIOUS ASPECTS OF BURN INJURIES, USSR

Oct. 31, 1963 26 p refs Transl. into ENGLISH of five articles from Eksperim. Khirur. i Anesteziol. (USSR) no. 4, 1963

(JPRS-21680; OTS-63-41041) OTS: $0.75

CONTENTS:

1. A CYBERNETIC METHOD OF DETERMINING THE SEVERITY AND PROGNOSIS OF BURN INJURY A. A. Vishnevskiy, S. N. Braynes, M. I. Shrayber, V. L. Brailovskiy, Y. V. Kuchina et al p 1–5 (See N64-10007 01-16)

2. A COMPARATIVE STUDY OF THE EFFECT ON THE ORGANISM OF EXPERIMENTAL THERMAL INJURY AND REMOVAL OF A LARGE AREA OF SKIN N. I. Kochetygov p 6–12 refs (See N64-10008 01-16)

3. FUNCTIONAL CHARACTERIZATION OF THE COURSE OF BURN SHOCK AGAINST A BACKGROUND OF RADIATION INJURY V. A. Suvorov, B. A. Saakov, D. I. Kolotiyenko, L. G. Alenina p 13–20 refs (See N64-10009 01-16)

4. VITAMIN B_1 (THIAMIN) CONTENT OF TISSUES IN BURN SHOCK V. G. Borisov p 21–23 refs (See N64-10010 01-16)

N64-10007 Joint Publications Research Service, Washington, D.C.

A CYBERNETIC METHOD OF DETERMINING THE SEVERITY AND PROGNOSIS OF BURN INJURY

A. A. Vishnevskiy, S. N. Braynes, M. I. Shrayber, V. L. Brailovskiy, Ye. V. Kuchina et al *In its* Various Aspects of Burn Injuries, USSR 1963 p 1–5 (See N64-10006 01-16) OTS: $0.75

A cybernetic method for the objective evaluation of the severity and prognosis of a patient's condition in the presence of burn injury is presented. The algorithm used divided the items given to it , described in several discrete parameters, into two classes on the basis of criteria developed by an electronic computer in the course of instruction. The signs or symptoms picked up from the case history were used as reference data in the problem of determining the prognosis of burn injury. Each characteristic was presented in discrete from. As a result of data processing, the condition of each patient was recorded as a number containing as many digits as there were symptoms selected. Results indicate that the method permits successful prognostication from a small number of symptoms that are furnished and evaluated by the computer. R.T.K.

N64-10008 Joint Publications Research Service, Washington, D.C.

A COMPARATIVE STUDY OF THE EFFECT ON THE ORGANISM OF EXPERIMENTAL THERMAL INJURY AND REMOVAL OF A LARGE AREA OF SKIN

N. I. Kochetygov *In its* Various Aspects of Burn Injuries, USSR 1963 p 6–12 refs (See N64-10006 01-16) OTS: $0.75

A comparative study of the effect on the organism of thermal injuries and removal of a large area of skin was conducted. The experimental subjects were 70 rabbits. A comparison of experimental results showed that both thermal injury and removal of skin over an area representing 15% to 20% of the body surface ultimately lead to similar consequences. This was corroborated by data concerning the survival rate of the animals, development of emaciation, changes in number of erythrocytes and leukocytes in the peripheral blood, as well as the morphological changes in the internal organs. In experiments on rabbits with burn injury over an area that did not exceed 20% of the body surface, two types of courses of thermal trauma were differentiated. In the first case, due to elevation of the temperature of a considerable mass of tissue, a severe physiological condition and death of the animals occurred within the first days. With the second type, the main disturbances developed later, as a result of loss of skin as an anatomical and functional organ. R.T.K.

N64-10009 Joint Publications Research Service, Washington, D.C.

FUNCTIONAL CHARACTERIZATION OF THE COURSE OF BURN SHOCK AGAINST A BACKGROUND OF RADIATION INJURY

V. A. Suvorov, B. A. Saakov, D. I. Kolotiyenko, L. G. Alenina *In its* Various Aspects of Burn Injuries, USSR 1963 p 13–20 refs (See N64-10006 01-16) OTS: $0.75

The changes in the cerebral cortex, subcortical centers, and autonomic nervous system when ionizing radiation is combined with burn injury were studied in dogs. The functional state of the cerebral cortex, the excitability of the vasomotor and respiratory centers, and that of the autonomic nervous system were recorded. Concurrently, the blood pressure and respiration rates were recorded, the blood flow rate was determined, and the morphological composition of the blood was examined. The functional disturbances that result from the effect of combined radiation and burn injuries are very different from the syndrome that develops after burn trauma of the same intensity, but without preliminary ionizing irradiation. This difference is due to a change in reactivity of the irradiated organism related to the peculiarities of the effect of penetrating radiation. The changes in reactivity were found to be due to changes in the functional state of the central nervous system, primarily that of the cerebral cortex. R.T.K.

N64-10010 Joint Publications Research Service, Washington, D.C.

VITAMIN B_1 (THIAMIN) CONTENT OF TISSUES IN BURN SHOCK

V. G. Borisov *In its* Various Aspects of Burn Injuries, USSR 1963 p 21–23 refs (See N64-10006 01-16) OTS: $0.75

The changes due to burn shock in thiamin content in tissues of experimental animals were investigated. Rabbits of both sexes were used. It was found that the vitamin B_1 level in tissues drops with burn shock; the free thiamin fraction increases significantly after a brief drop, while the bound fraction remains at a low level; and a rise in free thiamin level with low bound thiamin content is indicative of carboxylase breakdown with burn shock. R.T.K.

N64-10037 Joint Publications Research Service, Washington, D.C.

TOXICOLOGY OF CERTAIN RADIOACTIVE SUBSTANCES, USSR

A. A. Rubanovskaya Oct. 18, 1963 22 p refs Transl. into ENGLISH of two articles from Materialy po Toksikol. Radioaktivn. Veshchestv. (Moscow) 1962
(JPRS-21511; OTS-63-31967) OTS: $0.75

CONTENTS:

1. COMPOUNDS USED IN THE ELIMINATION OF RADIOACTIVE SUBSTANCES IN THE ORGANISM A. A. Rubanovskaya p 1–13 refs (See N64-10038 01-16)

2. POLYVINYL PYRROLIDONE IN AFFECTIONS WITH CERTAIN RADIOACTIVE ISOTOPES A. A. Rubanovskaya p 14–19 refs (See N64-10039 01-16)

N64-10038 Joint Publications Research Service, Washington, D.C.

COMPOUNDS USED IN THE ELIMINATION OF RADIOACTIVE SUBSTANCES IN THE ORGANISM

A. A. Rubanovskaya *In its* Toxicology of Certain Radioactive Substances, 1963 p 1–13 refs (See N64-10037 01-16) OTS: $0.75

Experiments demonstrating the effectiveness of calcium disodium diaminocyclohexanetetraacetate ($CaNa_2DCTA$) in accelerating the elimination and decreasing the tissue deposition of iron-59 is reported. In other studies, pectin was found to limit the absorption of Fe-59 into the gastrointestinal tract when the Fe-59 was administered orally with a small quantity of stable iron. M.P.G.

N64-10039 Joint Publications Research Service, Washington, D.C.

POLYVINYL PYRROLIDONE IN AFFECTIONS WITH CERTAIN RADIOACTIVE ISOTOPES

A. A. Rubanovskaya *In its* Toxicology of Certain Radioactive Substances, 1963 p 14–19 refs (See N64-10037 01-16) OTS: $0.75

The effectiveness of polyvinyl pyrrolidone (PVP) alone and in combination with other established radioprotective compounds in reducing the retention of radioisotopes in the body was investigated. PVP-100 introduced orally in rats immediately before the administration of strontium-90 decreased the absorption of the radioisotope into the gastrointestinal tract. However, simultaneous intraperitoneal and endocardial introduction of a mixture of $CaNa_2DCTA$ and PVP did not increase the elimination of intraperitoneally introduced Fe-59 over the amount eliminated as a result of $CaNa_2DCTA$ alone. M.P.G.

N64-10050 Joint Publications Research Service, Washington, D.C.

THE TECHNIQUES AND METHODS OF CONDUCTING PHYSIOTHERAPEUTIC PROCEDURES

K. F. Grishina and A. A. Komarova Nov. 5, 1963 48 p refs Transl. into ENGLISH from the book "Tekhnika i Metodika Provedeniya Fizioterapevticheskikh Protsedur", Leningrad, 1963 p 101–106, 115–118, 126–134, 160–169, 176–182, 183–191, 192–202, and Contents, 317–320
(JPRS-21725; OTS-63-41061) OTS: $1.25

The following methods of conducting electrotherapy are described: (1) electronarcosis, (2) diathermy, (3) ultrahigh frequency therapy, (4) microwave therapy, (5) aeorion therapy, and (6) ultrasonic treatment. R.T.K.

N64-10066 Joint Publications Research Service, Washington, D.C.

NEUROHUMORAL MECHANISMS OF RADIATION-INDUCED PERMEABILITY DISORDERS OF THE HISTOHEMATIC BARRIER

L.S. Shtern, M. M. Gromakovskaya, and S. Ya. Rapoport Oct. 18, 1963 30 p refs Transl. into ENGLISH of an article and the table of contents of the book "Gisto-Gematicheskiye Bar'yeri i Ioniziruyushchaya Radiatsiya", Moscow, 1963 p 17–38 and 216

(JPRS-21492; OTS-63-31958) OTS: $0.75

The role of nerve-reflex processes and homeostatic mechanisms in the changes in the permeability of the histohematic barriers associated with early radiation sickness is demonstrated. Experiments with irradiated white rats, using phosphorus-32 and iodine-131 as permeability radiotracers, are reported. Injection of various neurotropic agents (novocain, atropine, and morphine) both before and shortly after irradiation was found to eliminate or considerably reduce the permeability changes normally associated with irradiation. Shielding of the trunk, or local anesthesia of the abdominal organs with an oil solution of anesthetics also prevented the early permeability disorders. The results indicate that the permeability changes occur reflexly and are associated with a change in the afferent nerve impulses from abdominal organs. The role of the homeostatic mechanisms was demonstrated in similar experiments involving the injection of antihistimines and serotonin-liberating substances which also prevented the permeability disorders usually caused by X-irradiation. M.P.G.

N64-10067 Joint Publications Research Service, Washington, D.C.

ON SOME PROBLEMS OF BIOENERGETICS

V.N. Zholkevich Oct. 18, 1963 16 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 4, July/Aug. 1963 p 562-573

(JPRS-21501; OTS-63-31963) OTS: $0.50

This paper discusses the evaluation of respiration efficiency as a source of energy for endothermic processes of vital activity, as well as the mode of transmission of this energy in the living system. Some doubts are raised as to whether a fairly complete evaluation of the respiration efficiency is possible on the sole basis of oxidative phosphorylation. It is suggested that the energy balance composed of total energy released by tissue respiration (computed from the balance equation) and heat release might better suit the purpose. In the author's view, heat released by living tissues into the surroundings is of diverse origin, and that formed directly in the course of concomitant respiration makes but a part of total heat release. The latter is identified with the total loss of inner energy of the living system caused by the entire course of vital activity. If this be the case, the efficiency of respiration is indicated by its capacity to compensate this inevitable loss and to maintain thereby the necessary free energy level. Author

N64-10068 Joint Publications Research Service, Washington, D.C.

VALERIY BYKOVSKIY AND VALENTINA TERRESHKOVA-THE NEW COSMIC TANDEM

Florin Zaganescu Oct. 28, 1963 10 p Transl. into ENGLISH from Stiinta si Technica, v. 15, no. 7, July 1963

(JPRS-21613; OTS-63-41014) OTS: $0.50

The cosmic tandem flight of Valeriy Bykovskiy and Valentina Terreshkova is discussed. The design, construction, equipment, and organization of the Vostok 5 and the Vostok 6 spacecraft received attention along with the performance of the cosmonauts and the biotelemetry of prolonged spaceflight. Conclusions drawn from the spaceflight are that all the conditions for life and activity for a healthy man or woman, who has undergone suitable training, can be maintained for a prolonged period, and that the cosmonauts offer key assistance to the scientist in performing the complex tasks assigned to them. C.L.W.

N64-10069 Joint Publications Research Service, Washington, D.C.

STUDY OF THE MITOTIC CYCLE OF BONE MARROW CELLS IN MICE BY THE AUTORADIOGRAPHIC METHOD

A.I. Zosimovskaya Oct. 28, 1963 9 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (Moscow), v. 151, no. 3, 1963 p 687-690

(JPRS-21629; OTS-63-41024) OTS: $0.50

The duration of the generations of myelopoietic and erythropoietic cells separately was determined in male mice. All mice were given intravenous injections of tritiated thymidine with a specific activity of 2.5 curies per millimole, in a dose of 20 microcuries per 0.1 cc of physiological saline solution per mouse. The animals were sacrificed at various periods of time after administration, and autoradiographs of the number of labeled cells and labeled mitoses were counted. In the young myeloid cells and myelocytes the maximum quantity of the label was found one hour after the thymidine injection. In the metamyelocytes the label first appeared after 1 to 2 hours; in the stabs, after 7 to 10 hours; in the segmented neutrophils, after 18 to 22 hours. R.T.K.

N64-10117 Joint Publications Research Service, Washington, D.C.

PAIN AND ITS INFLUENCE ON THE HUMAN AND ANIMAL ORGANISM, USSR

S. M. Dionesov Oct. 28, 1963 6 p Transl. into ENGLISH of the Conclusion and Table of Contents of "Bol' i yeye Vliyaniye na Organizm Cheloveka i Zhivotnogo" Moscow, 1963 of the Conclusion and Table of Contents of "Bol' i yeye Vliyaniye na Organizm Cheloveka i Zhivotnogo" Moscow, 1963

(JPRS-21617; OTS-63-41016) OTS: $0.50

Bodily reactions to painful stimuli are reviewed. Two forms of pain reaction are distinguished: active, whereby a chain of reflex acts is directed to removing or getting away from the source of the painful stimulation; and passive, distinguished by a marked retardation of activity. The physiological changes associated with each of these pain reactions are summarized. The changes noted after pain stimulation generally fade away shortly, and the physiological activity of the organism is established on the previous prepain level. The completeness and the rate of recovery of normal activity depends on the state of the higher nervous system centers. In cases where the painful stimulation is long-lasting, a standing inhibition of a pathological nature occurs in the cerebral cortex, and lingering excitation is induced in the subcortex. Therefore, the means of reducing or eliminating pain should be regarded as therapy and studied further. M.P.G.

N64-10118 Joint Publications Research Service, Washington, D.C.

ROLE OF ENERGY METABOLISM IN RESTORATION OF IRRADIATED CELLS, USSR

L. A. Seliverstova and M. N. Meysel' Oct. 28, 1963 7 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 150, no. 6, 1963

(JPRS-21619; OTS-63-41017) OTS: $0.50

The recovery of the capacity for reproduction of X-irradiated *Saccharomyces vini* of the Megri 139B strain was investigated.

Cultures of this yeast, which were grown in relatively anaerobic conditions and which were characterized by the fermentative type of structural and functional organization, were capable of recovery following irradiation to a considerably lesser degree than cultures of this yeast which were grown under aerobic conditions, and which were distinguished by the respiratory type. Four days after incubation, 84% of the cells of the latter type were capable of reproducing, while only 50% of the fermentative type were capable of reproducing. *Saccharomyces cerevisiae* (race XII) was irradiated and cultured to determine how regular these differences in recovery capacity were, and whether they were unique to the species of yeast studied. The recovery of the ability to reproduce (following maintenance in water) in the cells of the respiratory type was much better than in the cells of the fermentative type. After three days' incubation, restoration in the former was 79%, while in the latter it was only 35%. I.v.L.

N64-10119 Joint Publications Research Service, Washington, D.C.
THE PERMEABILITY OF THE HEMATOENCEPHALIC BARRIER TO INORGANIC PHOSPHATE IN ACUTE RADIATION SICKNESS, USSR
D. A. Chetverikov and S. V. Gasteva 8 p refs Transl. into ENGLISH of an article from Dokl. Akad. Nauk SSSR (Moscow), v. 151, no. 3, 1963 p 718–721
(JPRS-21628; OTS-63-41023) OTS: $0.50

Rats which had been exposed to whole body X-ray irradiation were used in a study of the permeability of the hematoencephalic barrier to inorganic phosphate in acute radiation sickness. The permeability of the hematoencephalic barrier to inorganic phosphate was judged by the rate of passage of labeled inorganic phosphate from the plasma into the cerebral and spinal cord tissues. As a measure of this rate, the relative specific radioactivity of the inorganic of brain and spinal cord tissue was used, representing the ratio of the specific radioactivity of brain tissue inorganic phosphate to the specific radioactivity of blood plasma inorganic phosphate, expressed in percentages. C.L.W.

N64-10121 Joint Publications Research Service, Washington, D.C.
EFFECT OF RADIATION ON HEREDITARY MOLECULAR STRUCTURES, USSR
N. P. Dubinin Nov. 6, 1963 35 p refs Transl. into ENGLISH of the second chapter of "Molekulyarnaya Genetika i Deystviye Izlucheniy na Nasledstvennost" (Molecular Genetics and the Effect of Radiation on Heredity) Moscow, 1963
(JPRS-21754; OTS-63-41077) OTS: $1.00

Ionizing radiation, penetrating into the cell, injures the chromosomal nucleoproteins and their constituent DNA molecule. Irradiation of DNA causes a marked reduction of its viscosity, which is induced by breaks in the polymeric structural chains. The DNA molecules consist of two polynucleotide chains. If urea acts on such a two-chain molecule, it causes a break in the hydrogen bonds, and the molecule breaks down into single-chain structures. After the irradiation of such molecules, dissociated by means of urea, the break in the single-chain molecule is caused by the action of 10 to 20 ev. Also, specific changes take place in the chemical structure of the molecule. These changes are particularly important because they concern the nitrogen bases of which the code of genetic information is constituted. Ionizing radiation causes mutations in all representatives of the plant and animal kingdom and in viruses. Gamete mutations, caused by radiation, are transmitted to subsequent generations. The four main categories of gamete mutations are discussed. I.v.L.

N64-10137 North American Aviation, Inc., Downey, Calif. Space and Information Systems Div.
RAPID DETECTION OF TOXIC SUBSTANCES A SURVEY [OF LITERATURE]
Theodore N. Cranford June 17, 1963 21 p refs
(SID-63-755)

A survey of the literature on detection instruments used to monitor the concentration of toxic gases and other poisonous materials in the atmosphere is presented. Author

N64-10146 Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg (W. Germany) Inst. für Flugmedizin
ON THE PROBLEM OF THE ADAPTABILITY OF HUMANS UNDER VARIOUS LOADS WITH REGARD TO MANNED SPACEFLIGHT [ZUM PROBLEM DER ANPASSUNG DES MENSCHEN AN VERSCHIEDENARTIGE BELASTUNGEN IN HINSICHT AUF DIE BEMANNTE RAUMFAHRT]
K. E. Klein, H. Brüner, D. Jovy, and H. M. Wegmann [1963] 14 p refs In GERMAN Presented at the Ann. Meeting of the Wissen-schaftliche Gesellschaft für Luft- und Raumfahrt, Munich, Oct. 8–12, 1963

The adaptation of humans to the various stresses of spaceflight are reviewed. Two methods of adaptation are discussed. One concerns long-term residence in high mountains with a physical training program; this method provides adaptation to low atmospheric pressures. The second method concerns that used by American astronauts, where physical training and space simulation are provided. Regardless of the degree of physical adaptation acquired, only a relative protection can result. Catastrophic effects of extreme changes in environmental conditions can be hindered only by technical measures. Also, various effects of space environmental conditions on man are discussed. I.v.L.

N64-10154 California U., Berkeley Lawrence Radiation Lab.
BIO-ORGANIC CHEMISTRY Quarterly Report, Mar.-May 1963
July 29, 1963 149 p refs
(Contract W-7405-eng-48)
(UCRL-10934) OTS: $2.50

Papers are presented which include the following areas: fertility and sterility studies in mice; planarian studies; effects of environmental complexity and training on brain chemistry in rats; photosynthetic processes; isolation of the enzyme carboxydismutase; mechanism of the photoreduction of flavin adenine mononucleotide and its analogs; preparation of some ^{14}C labeled substances; optical properties of some dye-polyanion complexes; mechanism of thymine dimerization; organic molecule production on the "prebiotic" earth; ultraviolet and infrared spectra of some *ortho*-nitroamides; electron spin resonance of crystalline chlorophyll *a*; electron paramagnetic resonance signals in biological systems; and magnetic-rotary-dispersion instrumentation. R.T.K.

N64-10169* Melpar, Inc., Falls Church, Va.
DETECTION OF EXTRATERRESTRIAL LIFE. METHOD II: OPTICAL ROTATOR DISPERSION Third Quarterly Report, 19 June 1963 to Sept. 1963
[1963] 43 p
(NASA Contract NASw-557)
(NASA CR-52073) OTS: $4.60 ph, $1.49 mf

The theoretical development behind an apparatus, designed and incorporated into a spectrophotometer, which permits premeasurement of optical rotation in media which exhibits absorption, scattering, and circular dichroism is discussed. Optical rotatory dispersion measurements were obtained on pure

water, 0.15 N HCl, 0.15N NaOH, and 0.5N NaOH soluble extracts of soil. In the wavelength region from 230 to 280 mμ, both the water and acid-soluble extracts of soil exhibit negative optical rotations. The 0.15N NaOH extract of soil shows a positive optical rotation, and the 0.5N NaOH extract indicates no measurable rotation in this wavelength region. Below 240 mμ the more basic extracts exhibit negative rotation. For the basic extracts, the use of the more basic solution apparently results in a rupture of the chemical bonds responsible for the optical activity in the less basic extract. The positive rotations obtained for the less basic extracts may be caused by the nucleic acids or their derivatives. P.V.E.

N64-10190 Rochester U., N.Y. Div. of Radiology and Biophysics

IMMUNOLOGICAL REMOVAL OF CIRCULATING I^{131}-LABELED RABBIT ANTIBODY TO RAT FIBRINOGEN IN NORMAL AND TUMOR-BEARING RATS

Irving L. Spar, Ruth L. Goodland, and Mary Ann Desiderio Jan. 11, 1963 37 p refs

(Contract W-7401-eng-49)

(UR-634)

Purified I^{131} rabbit antibody to rat fibrinogen is substantially removed from circulation using goat antiserum to rabbit gamma globulin. Subsequent studies on I^{131} activity in organs of such rats show considerable immediate deposition of the radioactivity in the liver and somewhat less in the spleen; this is eliminated in 6 to 12 hours. I^{131}determinations on Murphy–Sturm tumors in such immunologically treated animals demonstrate little, if any, loss of tumor-deposited I^{131} for the first 24 hours. The bearing of these results on scintillation scanning techniques for tumors and thrombi is discussed. Author

N64-10197 Joint Publications Research Service, Washington, D.C.

SPACE MEDICINE

Fedor Dmitriyevich Gorbov and Aleksey Aleksandrovich Koreshkov Oct. 24, 1963 51 p refs Transl. into ENGLISH of a book "Kosmicheskaya Meditsina" Moscow, Znaniye Pub. House, 1963 p 3–54

(JPRS-21586; OTS-63-31997) OTS: $1.25

The history of man's desire to conquer space is reviewed from the time of the ancient Greeks to present-day Russian ventures into space. The environmental conditions to which man is subjected in space are discussed and include the following: high acceleration, weightlessness, solitude, sensory deprivation, artificial day–night schedules, cosmic rays, radiation belts, meteorites, and possible collisions of cosmic spacecraft. The selection and training of cosmonauts and the problem of providing nutrition for them in spaceflight are discussed. R.T.K.

N64-10198 Joint Publications Research Service, Washington, D.C.

CHEMICAL AND BIOLOGICAL ACTION OF ULTRASONICS

F. A. Gurevich, ed. Oct. 24, 1963 19 p refs Transl. into ENGLISH of four excerpts from book "O Khimicheskom i Biologicheskom Deystvii Ul'trazvuk", Krasnoyarsk, 1962 p 74–81, 156–163 and 206–207

(JPRS-21590; OTS-63-41001) OTS: $0.50

Conclusions from studies concerning the following areas of the chemical and biological actions of ultrasonics are presented and discussed: (1) reactions of the chemical effect of ultrasonics on water and water-soluble substances, (2) reactions of yeast cells to ultrasonic action, and (3) effect of ultrasonics and sonicated water on various biological materials. P.V.E.

N64-10201 Joint Publications Research Service, Washington, D.C.

AUTOMATIC CONTROL OF ALGAE CULTURES

Ye. A. Ivanov and I. V. Aleksandrova Oct. 28, 1963 13 p refs Transl. into ENGLISH from Usp. Sovren. Biol. (Moscow) v. 56, no. 1, 1963 p 90–97

(JPRS-21610; OTS-63-41013) OTS: $0.50

Air regeneration, based on photosynthesis of green plants, for prolonged manned flights in outer space is discussed. Such a system is an involved complex of equipment, whose control must be automatic. Automatic control of this system is discussed in terms of cultivation of one or several green plants, and in realizing, through photosynthesis, absorption of carbon dioxide from the cabin air and liberation of gaseous oxygen. C.L.W.

N64-10204 Joint Publications Research Service, Washington, D.C.

ON THE MODELING OF TEACHING PROCESSES IN AUTOMATIC SYSTEMS

Ye. V. Voloshinova and Ye. V. Shtil'man Nov. 7, 1963 20 p refs Transl. into ENGLISH from Avtomat. Regulir i Upr. (USSR), P 188–199

(JPRS-21770; OTS-63-41086) OTS: $0.50

An automatic system is called a learning system, if it finds an algorithm of action by way of automatic search, which is successful from some point of view, and is not put into the system by a person before the process of learning. Learning-automatic systems can be divided into three types: (1) automatic systems taught by humans, in which the role of the teacher is played by the human researcher; an example of this system is the pandemonium; (2) automatic systems taught automatically, where there is a separate automat-student and an automat-teacher; the replacement, for example, of a person by a teaching automat in the pandemonium is completely possible and in some respects even useful; after the completion of the learning process, the automat-teacher can be removed; (3) automatic systems with self teaching, in which there is no distinct separation into the student and teacher units, and the process of learning consists in the controlling part of the system changing, in a goal-directed manner, its laws of behavior, and finding, by way of automatic search, a successful algorithm. I.v.L.

N64-10205 Joint Publications Research Service, Washington, D.C.

DETECTORS FOR TOXIC GASES, VAPORS, AND DUST

Karlheinz Lohs Nov. 7, 1963 27 p refs Transl. into ENGLISH of parts of book "Nachiwiesgerate fur Giftige Gase, Dample, and Staube", Berlin, Deutscher Militarverlage, 1962 p 5, 57, 75, 77–78, 92–93, 111–116, 125–131, 135–139, 144–145, 157–179, 180–189, and 211–212

(JPRS-21771; OTS-63-41087) OTS: $0.75

A review of instruments used for the detection of gases, vapors, and dust is presented. Instruments of both the Soviet bloc and Allied countries are discussed. P.V.E.

N64-10206 Joint Publications Research Service, Washington, D.C.

THE PROBLEM OF THE RATE OF PROPAGATION OF ULTRASONIC WAVES IN THE BLOOD

I. R. Yevdokymov Nov. 7, 1963 6 p refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukr. RSR (Kiev), no. 7, 1963 p 927–929

(JPRS-21775; OTS-63-41089) OTS: $0.50

The rate of propagation of ultrasonic waves in the blood and blood plasma of dogs has been used to demonstrate

changes of a phasic nature in the dynamics of acute radiation sickness. The phases of changes in the speed of sound in the blood of irradiated dogs are found to coincide with the periods of radiation sickness. The rate of propagation of ultrasonic waves in the blood of dogs given doses of 100 and 150 kr. was studied *in vitro*, as well as the propagation rate in *in vitro* plasma irradiated with doses of 100 and 150 kr., and in blood given a dose of 300 kr. after dilution with physiological saline. At the same time, the specific gravity of the blood and plasma was determined to calculate the adiabatic compressibility by the pyknometric method. The studies show that the changes in the speed of sound in the blood are not produced by the direct effect of ionizing radiation on the blood, and that such radiation has no direct effect on the degree of hydration of plasma proteins or the structural integrity of the red blood cells. D.E.R.

N64-10207 Joint Publications Research Service, Washington, D.C.
MORPHOLOGICAL CHANGES IN THE INTERNAL ORGANS AND SKIN FROM LOCAL ULTRASONIC IRRADIATION
S. A. Bershteyn Nov. 7, 1963 7 p refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukr. RSR (Kiev) no. 7, 1963 p 924–927
(JPRS-21776; OTS-63-41090) OTS: $0.50

The author investigated the morphological changes of the internal organs and skin of rabbits on irradiation of the lumbar region with ultrasound of 800 kc frequency, 3 w/cm^2, 1 w/cm^2, and 0.3 w/cm^2 intensity, with 15 min exposure. Distinct pathomorphological changes in the internal organs were found only on irradiating with an intensity of 3 w/cm^2 and 1 w/cm^2. Irradiating with an intensity of 3 w/cm^2 and 1 w/cm^2 provokes a pronounced reaction of the blood vessels. A high sensitivity to ultrasound was found in the sexual glands, where despite the remoteness from the field of irradiation, degenerative changes and a decrease in the quantity of mature forms of sexual cells are observed. The peripheral nervous system does not remain intact to ultrasonic irradiation, as is indicated by the degenerative changes in the nerve elements. Author

N64-10236 Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg (W. Germany) Inst. für Flugmedizin
ELECTROCARDIOGRAPHIC INVESTIGATIONS ON THE EFFECT OF ACCELERATION [ELEKTROKARDIOGRAPHISCHE UNTERSUCHUNGEN UNTER BESCHLEUNIGUNG-SEINWIRKUNG]
F. Kniep Aug. 1963 44 p refs In GERMAN
(DVL-259) Available from Verenigte Universitats- U. Fach-Buchhandlungen, R.-Wagner Str., Cologne, W. Germany

In modern air and space travel, man is subjected to forces of acceleration which affect his circulation. Changes in circulation occur, causing considerable change in electrocardiograms. This anomaly was investigated by electrocardiographic tests of 22 healthy males in the centrifuge of the Institute for Flight Medicine of the DVL. The maximum accelerations were 4 and 4.5 g. The acceleration caused an increase in the heart rate and a leveling off of T II and T III. The change in the contraction mode of the heart appeared to be the main cause of the T-change. Trans. by I.v.L.

N64-10264 National Academy of Sciences, Washington, D.C. Space Science Board
WORKING GROUP ON NUTRITION AND FEEDING PROBLEMS Summary Report
Apr. 1963 22 p

This report describes the results of discussions and inquiries into the problems of feeding and nutrition in spaceflights of various durations. Author

N64-10265 National Academy of Sciences, Washington D.C. Space Science Board
WORKING GROUP ON PROBLEMS OF WEIGHTLESSNESS IN SPACE FLIGHT Summary Report
Apr. 1963 56 p refs

This report describes the results of discussions of the physiological effects of the weightless state which may be of importance in the development of spaceflight and contains suggestions for experimental investigations to make good the important deficiencies in present knowledge. Author

N64-10266 National Academy of Sciences, Washington D.C. Space Science Board
POSITION PAPER ON THEORETICAL ASPECTS OF RADIO BIOLOGY AS APPLIED TO THE SPACE PROGRAM
Aug. 1963 12 p refs

The Space Science Board has undertaken to study several aspects of the space program which involve biological interests. These topics are of two kinds: those which concern the sustaining of man in spaceflight, and those which concern the potential contributions to biology itself which may come from the ability to conduct experimental investigations in space. This report is on a subject of the latter kind and discusses, from a fundamental point of view, radiation biology in space research. Author

N64-10269 Joint Publications Research Service, Washington, D.C.
PHILOSOPHICAL ASPECTS OF LIFE ON THE MOLECULAR LEVEL
R. S. Karpinskaya and Ye. F. Solopov Nov. 8, 1963 33 p refs Transl. into ENGLISH from Voprosy Filosofii (Moscow) v. 17, no. 8, 1963 p 104–114 and 143–154
(JPRS-21806; OTS-63-41107) OTS: $1.00

A discussion is given concerning the structure and function of living matter on the molecular level, and the correlation between forms of motion and forms of matter in nature. C.L.W.

N64-10270 Joint Publications Research Service, Washington, D.C.
PROGRAMMING SOCIAL RESEARCH AND A DESCRIPTION OF CYBERNETIC MODELS
I. V. Novik Nov. 8, 1963 34 p refs Transl. into ENGLISH from Voprosy Filosofii (Moscow) v. 17, no. 8, 1963 p 92-103
(JPRS-21807; OTS-63-41108) OTS: $1.50

The basic types of cybernetic models are examined, and an attempt is made to disclose their gnoseological peculiarities. Author

N64-10293* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
A THIOL-ACTIVATED AMINOPEPTIDASE OF THE PITUITARY
Stanley Ellis Repr. from Biochem. and Biophys. Res. Commun. v. 12, no. 6, 1963 p 452–456 refs
(NASA RP-55)

It has been shown that, besides the common manganese activated aminopeptidase of the pituitary, pituitary extracts also contain a thiol-activated aminopeptidase which is inhibited by sulfhydryl reagents. This enzyme has been found to hydrolyze the amino acid naphthylamides in the following descending order: arginine, lysine, phenylalanine, leucine, alanine, and tyrosine. L-phenylalanine-p-nitroanilide and acetyl-L-phenyl and benzoyl-DL-arginyl-p-nitroanilide were not

hydrolyzed by the enzyme, indicating that it is an aminopeptidase. Also, the addition of octapeptide disulfides and glucagon inhibited the action of the enzyme. D.E.R.

N64-10302* National Aeronautics and Space Administration, Washington, D.C.
BIOASTRONAUTICS
Eugene B. Konecci Repr. from Astronautics, Nov. 1962 p 104–109
(A63-10206)

The Biotechnology and Human Research Program of NASA is discussed, and a review of several Government- and company-funded life-sciences programs is presented. A review is also presented of space-suit development, particularly Soviet space suits. P.V.E.

N64-10326 Joint Publications Research Service, Washington, D.C.
COMPARISON OF THE HARMFUL EFFECT OF FAST NEUTRONS AND X-RAYS ON MOUSE TESTES
M. D. Pomerantseva and L. K. Ramayya Oct. 21, 1963 8 p refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 150, no. 6, 1963 p 1370–1372
(JPRS 21521; OTS 63-31973) OTS: $0.50

X-irradiation doses of 20, 50, 100, 200, 300, 400, 600, 800 and 1600 r and fast neutron doses of 17, 34, 57, 114, 171, and 228 rads were used, and changes in weight and histologic picture were used as indices of the degree of radiation damage. Maximum reduction in testes weight occurred 28 days after irradiation for both X- and neutron-radiation. Dose dependence was evident only at the lower doses where a linear relationship was found between the degree of weight reduction and the log of the dose of radiation. Histologic examination revealed that the most immature germinal cells were the first affected by radiation, followed by a gradual decrease in the other germinal cells, until a maximum reduction in spermatozoa occurred on the 28th day after irradiation. After the point of maximum reduction of each type of cell, gradual restoration began. These data indicate that the relative biological effectiveness of fast neutrons decreases with increasing dose of radiation, so that, in doses causing a reduction in testicular weight of 50%, the relative biological effectiveness is about 3.5. M.P.G.

N64-10327 Joint Publications Research Service, Washington, D.C.
THE EFFECT OF COSMIC FACTORS ON THE BLOOD SYSTEM
N. A. Shul'ts Nov. 14, 1963 15 p refs Transl. into ENGLISH of an article from Probl. Gematol. i Pereliv. Krovi (Moscow), v. 8, no. 3, Mar. 1963 p 20–26
(JPRS-21864; OTS-63-41136) OTS: $0.50

The effects of solar radiation and other solar phenomena occurring in times of increased solar activity on the human blood and circulatory system are discussed. It has been found that the frequency of cerebrospinal meningitis is connected with the incidence of sunspots. The relationships between eclampsia and pre-eclampsia and geomagnetic disturbances, between the stability of colloidal solutions and solar activity, between the incidence of solar flares and the number of leukocytes in the blood, and the effect of cosmic radiation intensity of the incidence of leukopenia are also discussed. D.E.R.

N64-10328 Joint Publications Research Service, Washington, D.C.
DEVELOPMENT OF BIOLOGICAL SCIENCES AND PROSPECTS FOR DEVELOPMENT OF RADIOBIOLOGY
Ye. I. Vorob'yev and L. V. Funshteyn Nov. 14, 1963 8 p Transl. into ENGLISH of an article from Med. Radiol. (Moscow), v. 8, no. 9, Sept. 1963 p 3–7
(JPRS-21868; OTS-63-41138) OTS: $0.50

Attention is given to the development of research on the effect of irradiations on organisms, on finding means of recognizing and treating radiation injuries, and on problems of biophysics and radiation genetics. C.L.W.

N64-10329 Joint Publications Research Service, Washington, D.C.
THE ROLE OF BIOPHYSICS, CHEMISTRY AND CYTOLOGY IN THE DEVELOPMENT OF MEDICINE
V. G. Yeliseyev Nov. 21, 1963 10 p Transl. into ENGLISH of an article form Terap. Arkh. (Moscow) v. 35, no. 8, 1963 p 3–9
(JPRS-21966; OTS-63-41186) OTS: $0.50

The main tasks of these sciences should be considered the determination of the nature of the phenomena of life; the demonstration of the biological principles of development of the organic world; study of physics and chemistry of the living; the development of various means of controlling vital processes, particularly metabolism, heredity, and directed changes in organisms. J.E.T.

N64-10371* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
A BIBLIOGRAPHY OF EXOBIOLOGY
Michael H. Briggs, Gregg Mamikunian, and John P. Revill, comp. [1962] 109 p refs
(NASA CR-52484) OTS: $9.10 ph, $3.74 mf

A selected bibliography of exobiology, covering the following topics, is presented: (1) literature on the existence of life outside the earth; (2) the origin and development of life; (3) the chemical and physical properties of the atmospheres and surfaces of the planets and the moon; and (4) the origin of the solar system and the incidence of extrasolar planets. R.T.K.

N64-10386 Joint Publications Research Service, Washington, D.C.
STUDIES OF RADIATION IN SANITATION
A. S. Zykova, Ye. L. Telushkina, G. P. Yefremova, V. P. Rublevskiy, and G. I. Sidorenko Nov. 21, 1963 21 p refs Transl. in ENGLISH of four articles from Gigiena i Sanit. (Moscow), v. 28, no. 9, Sept. 1963 p 5–11, 97–98, 101–103 and 124–125
(JPRS-21975; OTS-63-41190) OTS: $0.50

Data are given on the dynamics of radioactive precipitations and that of radioactive content of the atmospheric air in Moscow during the period from 1957 to 1961, and the use of the combined effects of gamma radiation and chlorine for sterilization of water is studied. The maximal concentrations of radioactive substances in the atmospheric air were noted in March 1958 and amounted to $1.0 \cdot 10^{-14}$ curies per liter. In 1957, 1047 millicuries of long-life beta active substances fell per square kilometer of ground surface in the investigated district; in 1958, 998 millicuries per kilometer; in 1960, 45.88 millicuries per kilometer; and in 1961, 220 millicuries per kilometer. Radiochemical analysis revealed the atmospheric precipitates to contain strontium 90, cesium 137, and cerium 144. The use of the combined effect of chlorination and gamma irradiation for water sterilization was found to be highly effective. With the combined effect, a quantity of chlorine amounting to one-third of the chlorine demand of the water and one-tenth of the dose of gamma radiation necessary for producing

100-percent sterilization when chlorine or gamma radiation is used separately is adequate for achieving the sterilizing effect. C.L.W.

N64-10388 Joint Publications Research Service, Washington, D.C.
CEREBRAL HYPOXIA IN RESPONSE TO GRAVITY EFFECTS WHILE BREATHING OXYGEN
Ye. A. Kovalenko, V. L. Popkov, and I. N. Chernyakov Nov. 21, 1963 13 p refs Transl. into ENGLISH from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 7, no. 5, Sept.–Oct. 1963 p 9–15
(JPRS-21984; OTS-63-41199) OTS: $0.50

The polarographic method was used to determine oxygen intensity (pO_2) in the brain cortex of dogs which were undergoing rotation in a centrifuge. The pO_2 value recorded prior to rotation was assumed to be 100 percent. With air respiration overloadings of 8, 10, and 12 g in the transverse direction, lasting up to 3 minutes, produced a pO_2 drop in cellular tissues of dogs, averaging 85.9, 77.6, and 60 percent, respectively. With oxygen breathing overloading caused a smaller pO_2 decrease in cerebral tissues, equaling 107, 98, and 93 percent, respectively. Furthermore, the animals showed greater resistance to overloading, and their cardiac activity demonstrated a tendency toward normalization. Forced oxygen breathing resulted in a higher positive effect, which could be seen distinctly only with overloading up to 10 g. It is presumed that cerebral hypoxia seen under the effect of overloadings is not the only factor in the pathogenesis of disorders produced by accelerating forces. Author

N64-10389 Joint Publications Research Service, Washington, D.C.
SOME DISTRIBUTION CHARACTERISTICS OF Sr^{90} IN THE SKELETON OF DOGS AFTER SINGLE AND LONG-TERM ADMINISTRATIONS
A. A. Yusupov Nov. 21, 1963 5 p refs Transl. into ENGLISH from Akad. Nauk Uz. SSR, Uzbeksk Biol. Zh. (Tashkent), v. 7, no. 4, 1963 p 35–36
(JPRS-21997; OTS-63-41212) OTS: $0.50

The autoradiographs indicated substantial differences in the distribution of Sr^{90} in various skeletal bones. Both after a single administration and after long-term administration, this element is unequally distributed in various parts of the mandible. The isotope was found in the incisors in larger quantity than in the premolars and molars, and is firmly fixed in the dentine of the teeth, whereas it is almost absent in the enamel. In the vertebrae and sternum in both experimental variants, Sr^{90} was distributed comparatively uniformly. In the ribs, a uniform distribution was recorded after long-term administration. In the long bones (tibia, humerus, femur, and others), both after single and long-term administration, a relatively high content is found in the epiphyses. P.V.E.

N64-10390 Joint Publications Research Service, Washington, D.C.
APPARATUS FOR REMOVAL OF DENTAL CALCULUS WITH ULTRASOUND
A. A. Kolosov, et al Nov. 21, 1963 11 p Transl. into ENGLISH from Med. Prom. SSSR (Moscow), v. 17, no. 9, Sept. 1963 p 53–58
(JPRS-21998; OTS-63-41213) OTS: $0.50

A stomatological apparatus developed for the removal of dental calculus with ultrasound is described. The removal of film, supragingival, and subgingival calculus from the teeth is accomplished by means of light contact with an ultrasonic tip against the tooth surface being treated. The apparatus operates without abrasive suspensions, only water is used. A magnetostrictive method of obtaining ultrasonic waves is used for the removal of dental calculus. P.V.E.

N64-10391 Joint Publications Research Service, Washington, D.C.
THE EFFECT OF TRAINING FOR HYPOXIA ON THE COURSE OF BURN SICKNESS
G. S. Fenster Nov. 21, 1963 7 p refs Transl. into ENGLISH from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 7, no. 5, Sept./Oct. 1963 p 40–43
(JPRS-21999; OTS-63-41214) OTS: $0.50

The effect of training for oxygen deficiency in white rats immediately after the infliction of a severe burn is discussed. For the purpose of training for oxygen deficiency, the burned animals were "raised" in an altitude chamber to an "altitude" of 5,000 to 6,000 meters every day for 10 days, beginning with the second to fourth day after the burn, for 3 hours a day. Conclusions reached as a result of the study include: (1) hypoxia used for the training of burned rats in the first 10 days after a severe burn gives a pronounced therapeutic effect, considerably reduces the mortality of the animals in burn sickness, and delays the development of anemia; and (2) three factors possibly play a part in the mechanism of the therapeutic–prophylactic effect of training for hypoxia: (a) the antianemic effect of hypoxia, (b) increase in the suprarenal function under the influence of hypoxia, and (c) increase in the resistance of oxidative enzymes to unfavorable conditions after training of the animals under conditions of hypoxia. P.V.E.

N64-10392 Joint Publications Research Service, Washington, D.C.
THE EFFECT OF SEX HORMONES ON THE COURSE OF ACUTE RADIATION SICKNESS
S. A. Davydova Nov. 21, 1963 8 p refs Transl. into ENGLISH from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 7, no. 5, Sept.–Oct. 1963 p 45–48
(JPRS-22000; OTS-63-41215) OTS: $0.50

The comparative protective and therapeutic action of sex hormones—estrogens (folliculin, diethylstilbestrol, synestrol, dimestrol, ethyinylestradiol, octestrol) and androgens (testosterone and methyltestosterone)—was studied in experiments on 1181 mice and 555 rats, irradiated with gamma rays (Co^{60}) in doses of 650 to 700 r ($LD_{75\ to\ 100}$). The prophylactic effect of sex hormones was selective with respect to the species and sex of the animals; it was weak with poor reproduction. The protective effect (a rise of the survival by 18 to 26.5 percent) was revealed only in experiments on mice with some estrogens (folliculin and diethylstibestrol) and the specified androgens, given 5 to 10 days before the irradiation. Administration of female and male sex hormones to treat the irradiated mice proved to be unsuccessful or even aggravated the development of acute radiation sickness. Author

N64-10393 Joint Publications Research Service, Washington, D.C.
CHARACTERISTICS OF THE COURSE OF SHOCK CAUSED BY COMPRESSION OF SOFT TISSUE UNDER CONDITIONS OF ACUTE RADIATION INJURY
B. I. Krivoruchko Nov. 21, 1963 6 p refs Transl. into ENGLISH from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 7, no. 5, Sept.–Oct. 1963 p 72–73
(JPRS-22001; OTS-63-41216) OTS: $0.50

Experiments performed to determine the characteristics of traumatic shock under conditions of acute radiation injury are

discussed. Compression of the soft tissues of the thighs of rabbits was produced by the application of a tourniquet for four hours. The behavior of the animals, blood pressure, EKG, pressor vascular reflexes, the adenosine triphosphoric acid, creatine phosphate, inorganic phosphorus and lactic acid contents in the brain, respiration, body temperature and longevity was studied. The resistance to injury in the irradiated animals was less than in the control rabbits. In the control experiments severe shock developed mainly after the compression was stopped, in the irradiated rabbits, even during the period of compression, a marked fall in the blood pressure was observed, with depression of the bioelectric activity of the cerebral cortex and death. Of ten animals irradiated, four died during the compression period. It is concluded that under conditions of acute radiation injury, shock from soft tissue compression frequently occurs during the period of compression and has a more severe course. P.V.E.

N64-10407 Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.
NORFOLK-PENINSULA AREA (ARMS-II) Civil Effects Study [Oct. 16-29, 1961]
R. B. Guillou Oak Ridge, Tenn., AEC, Div. of Tech. Inform., Dec. 6, 1961 22 p refs
(CEX-6164)

An Aerial Radiological Measuring Survey (ARMS) of the Norfolk–Peninsula area was made as part of a nationwide program to measure present environmental levels of gamma radiation. Aerial measurements of ground radioactivity were everywhere consistent with what was expected, considering the geology of the area. Most of the area has a low radioactivity and the surficial materials are mostly sands and gravels, which are commonly weakly radioactive. The western part of the area is slightly more radioactive, which would be expected from the older sedimentary rocks of the coastal plain exposed there in valleys. Artificial radionuclides are probably present in only small quantities because the maximum background gamma radioactivity in many places is less than 200 counts/sec. Author

N64-10408 Oak Ridge National Lab., Tenn.
GENERAL CORRELATIVE STUDIES – OPERATION BREN
J. A. Auxier, F. F. Haywood, and L. W. Gilley May 1963 40 p refs
(CEX-6203) OTS: $1.00

A summary of the utilization of the Health Physics Research Reactor and a Co^{60} source during Operation BREN has been prepared, and the pertinent meteorological data has been tabulated. Normalization factors for air dose, as it depends on air density and reactor power level, are obtained as a function of source height; typical dose vs. distance curves are presented. For a source height of 1125 ft and with the detector at the surface of the ground, the relaxation length in air is 230 yards for neutrons from the reactor, 311 yards for gamma radiation from the reactor (including gamma rays from inelastic interactions by neutrons in air), and 256 yards for the gamma rays from Co^{60}. These reduce to 181, 245, and 200 yards, respectively, at 760 mm Hg pressure and 0° C. Author

N64-10428 Atomic Energy Commission, Idaho Falls, Idaho Idaho Operations Office
STANDARD HEALTH AND SAFETY REQUIREMENTS
Sept. 1963 285 p refs
(ID Manual 0500-1; IDO-12028)

Standard health and safety requirements are given for the benefit of all personnel at the Nuclear Reactor Test Site (NRTS). The published guide includes the following topics: (1) organization and program; (2) plant design and layout; (3) production, maintenance, construction, and demolition; (4) permanent equipment and facilities; (5) guarding and operating machinery; (6) materials handling and storage; (7) electrical hazards; (8) chemical hazards; (9) fire protection and prevention; (10) flammable liquids; (11) hand and portable power tools; (12) motor vehicle operations; (13) personal protective equipment; (14) industrial hygiene; (15) construction and materials-handling equipment; (16) occupational medicine; (17) health physics; (18) nuclear safety outside reactors; and (19) an annex covering topics on a safety and accident-prevention program. R.T.K.

N64-10430 Atomic Energy Commission, N.Y. Div. of Tech. Information
ATLAS ON THE PATHOLOGICAL ANATOMY OF ACUTE RADIATION SICKNESS IN EXPERIMENT
L. V. Funshtein May 1963 224 p refs Transl. from Publ. "Atlas Patologicheskai Anatomii Ostroi Luchevoi Bolezin V. Eksperimente", Leningrad, State Pub. House for Med. Lit., 1961 p 1–218
(AEC-tr-5630) OTS: $3.00

An atlas showing the changes in various parts of rabbits subjected to internal and external radiation is presented. The following periods of irradiation and convalescence are covered: (1) external irradiation—morphological changes occurred (a) in death during irradiation, (b) up to two days after irradiation, (c) three to seven days after irradiation, (d) the second week after irradiation, and (e) the third week after irradiation; (2) internal irradiation—morphological changes occurred (a) the fourth day of irradiation, (b) the fifth to seventh days of irradiation, (c) the second week of irradiation, (d) the third week of irradiation, and (e) the fourth week of irradiation. P.V.E.

N64-10433 Royal Norwegian Air Force, Blindern Inst. of Aviation Medicine
SEPARATION OF NORMAL HEMOGLOBINS IN PILOTS
B. Bugge-Asperheim [1962] 5 p refs
(Rept. 63-2)

An investigation into whether the effects of mild hypoxia, often present in Air Force pilots, could be strong enough to cause a change in the hemoglobin fractions usually present in adult blood is discussed. Blood samples were examined from 8 cargo pilots and, as a control, from 14 fighter pilots. The results showed that neither an A-R-Hb fraction above 1.0 percent nor a pathological Hb F fraction were detected in the blood from the 22 pilots. Also, abnormal amounts of the Hb A fraction or the minor components Hb A_1 and Hb A_2 were not found. P.V.E.

N64-10453 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM DOKLADY AKEDEMII NAUK SSSR (REPORTS OF THE ACADEMY OF SCIENCES USSR) (RADIOBIOLOGY)
L. A. Kashchenko, Ye. D. Babskiy, A. L. Baranovskiy, G. Z. Ganyelin, L. S. Ul'yaninskiy et al Mar. 11, 1963 18 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (Moscow), v. 147, no. 1, 1962 p 217–220 and 255–258
(JPRS-18045; OTS-63-21290) OTS: $0.50

Two topics are discussed. In the first, the radiation injury mechanism in mouse ovaries is investigated by irradiating the ovaries of sexually mature mice. In the second, electrical stimulation of the heart by means of radiofrequency impulse transmission and by induction is investigated. A discussion of results as well as a complete bibliography is included for each topic. J.E.T.

N64-10456 Joint Publications Research Service, Washington, D.C.
REMOVING RADIOACTIVE ISOTOPES FROM ORGANISMS
V. S. Balabukha, L. M. Razbitnaya, N. O. Razumovskiy, and L. I. Tikhonova Apr. 18, 1963 15 p refs Transl. into ENGLISH from book "Problemiy Vyvedeniya Iz Organizma Dolgozhivushchikh Radioaktivnykh Izotopov" Moscow, State Publ. House for Atomic Sci. and Technol., 1962 p 5–12 and 166–167
(JPRS-18775; OTS-63-21608) OTS: $0.50

The increase in environmental radioactivity due to fallout of radioactive isotopes is cited, and the types of radioactive elements encountered and their potential danger to the human organism are reviewed. Two types of chemical substances may be utilized to protect against these isotopes: (1) compounds of large molecular size and poor solubility which are capable of sorption of radioisotopes in the gastrointestinal tract, thus preventing the transport of the isotopes into the blood stream; and (2) low-molecular-weight organic compounds which form stable complexes with the isotopes in the blood, do not enter into any metabolic reaction, penetrate the kidney barrier, and are rapidly eliminated in the urine. Since the isotopes considered are representatives of different periodic groups and possess different physicochemical properties, the radioprotective compounds must be specific for individual radioisotopes. M.P.G.

N64-10465 European Atomic Energy Community, Brussels (Belgium)
MOBILE DECONTAMINATION UNIT OF PERSONS [STATION MOBILE DE DECONTAMINATION DES PERSONNES]
M. Collet, L. Musso and P. Recht Aug. 1963 29 p refs In FRENCH; ENGLISH summary
(EUR-407.f)
Available from Belgian American Bank and Trust Co., N.Y., account no. 121.86; 40 Bel. Fr.

The present report describes a mobile decontamination unit. This vehicle has been constructed for action at any point in Europe at which a nuclear incident may occur. A description is also given of the equipment designed for the decontamination of persons, and there are details of the unit's ability to operate for long periods without refueling. Author

N64-10476 Joint Publications Research Service, Washington, D.C.
PRODUCTION BASES FOR THE DEVELOPMENT OF UNICELLULAR ALGAE
N. P. Arutyunyan Feb. 1, 1963 15 p refs Transl. into ENGLISH from Izv. Akad. Nauk Arm SSR, Bil. Nauki (Yerevan), v. 15, no. 11, Nov. 1962 p 85–93
(JPRS-17433; OTS-63-21044) OTS: $0.50

A discussion is given concerning the mass cultivation of unicellular green algae to obtain protein-rich biomasses. These biomasses are to be used in the same way as meat, in effect, as the raw material for human food, for physiologically active materials, and therapeutically valuable preparations. All the conditions upon which the production of unicellular algae depends are investigated in an attempt to develop objective methods and to make use of the least expensive material-technical means. C.L.W.

N64-10501 Joint Publications Research Service, Washington, D.C.
TELEVISION MICROSCOPY IN BIOLOGY AND MEDICINE, REVIEW OF THE LITERATURE
P. Zykov and L. G. Bakinova Mar. 22, 1963 7 p refs Transl. into ENGLISH from Lab. Delo (Moscow), no. 1, 1963 p 3–5
(JPRS-18229; OTS-63-21392) OTS: $0.50

Any television microscope can be classified into either of two groups, according to the lighting used, (1) with projection of the image onto the transmission tube, and (2) based on the principle of the scanning beam. In the latter case, the image is reproduced as a result of the optical scanning of the object by a moving beam of light. A tremendous advantage of ultraviolet television microscopy is the feasibility of direct observation on the television screen of details of cell structure that are not visible to the naked eye using the conventional microscope. It has been proposed that a device, containing a metal plate coated with a semiconductor layer, which at the same time serves as the target for a vidicon tube, be mounted in the electron microscope in lieu of the screen. The potential relief formed on the semiconductor coating by the projection of the image of the specimen is converted to an electrical signal, which is amplified by a conventional television channel. P.V.E.

N64-10503 Joint Publications Research Service, Washington, D.C.
MEDICINE AND THE COSMOS
V. Vasilevskiy and Yu. Fedotov Apr. 9, 1963 13 p refs Transl. into ENGLISH from Molodoi Kommunist (USSR), no. 12, Dec. 1962 p 45–50
(JPRS-18627; OTS-63-21547) OTS: $0.50

The effects on man of noise and vibration, acceleration and weightlessness, and human biological rhythms during spaceflights are discussed. P.V.E.

N64-10504 Joint Publications Research Service, Washington, D.C.
MANGANESE OXIDES, THEIR COMPARATIVE TOXICITY, HYGIENIC SIGNIFICANCE AND CLINICAL PICTURE OF THE CHRONIC EFFECT OF MANGANESE
N. V. Lazarev and E. N. Levina, ed. Apr. 15, 1963 40 p refs Transl. into ENGLISH of portions of a book "Okisly Margantsa Sravnitel'nava Ikh Toksichnost', Gigiyenicheskoye Znacheniye i Klinika Khronicheskogo Vozdeystyiya Margantsa", Leningrad, 1962 p 2–6, 14–18, 108–130, and 153–163
(JPRS-18698; OTS-63-21574) OTS: $1.00

In vitro experiments have demonstrated that the solubility of the various manganese oxides in the blood varies from 3 to 8 milligrams percent. Manganous oxide is the most soluble, but manganese dioxide is retained longer in the circulatory system. The experiments have shown that the toxicity of the manganese oxides increases directly with the higher valence states of the manganese ion, trivalent and tetravalent. *In vivo* experiments show that all the oxides are more toxic when administered endotracheally than when given by inhalation of aerosols. Pneumoconiosis can be produced in the lungs by all the oxides, but the more virulent forms are produced by the higher oxides, with Mn in the trivalent or tetravalent states. Since the physicochemical properties of these compounds are similar, it is proposed that the valence state of the metal is primarily responsible for the different toxicities. D.E.R.

N64-10513 Joint Publications Research Service, Washington, D.C.
HERALD OF THE ACADEMY OF MEDICAL SCIENCES USSR, VOLUME 18, NUMBER 8, 1963 [VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR]
Oct. 21, 1963 145 p refs Transl. into ENGLISH
(JPRS-21526; OTS-63-31975) OTS: $2.75

CONTENTS:

1. SOME RESULTS AND TASKS IN THE FIELD OF SPACE RADIOBIOLOGY P. P. Saksonov, V. V. Antipov, and N. N. Dobrov p 16–26 refs (See N64-10514 01-16)

N64-10514 Joint Publications Research Service, Washington, D.C.

SOME RESULTS AND TASKS IN THE FIELD OF SPACE RADIOBIOLOGY

P. P. Saksonov, V. V. Antipov, and N. N. Dobrov *In its* Herald of the Acad. of Med. Sci. USSR, v. 18, no. 8, 1963 p 16–26 refs (See N64-10513 01-16)

The work demonstrates that, when there are no flashes in the sun's chromosphere, short-term flights along the orbits lying below radiation belts of the Earth do not present any hazards for man. However, in protracted cosmic flights along orbits traversing periglobal radiation belts and, particularly, during solar outbursts generating protons, cosmic radiation is one of the main difficulties standing in the way of man's mastering cosmic space. In this connection, the first and foremost problems to be considered are those of determining the relative biological efficiency of individual components in cosmic radiation, the study of the effect of cosmic radiation on the biological set of factors in cosmic flight, the search for principles and adequate means of physical and pharmacological protection of man and for the entire biological complex, along with the elaboration of methods for physical and biological dosimetry, etc. Author

N64-10515 Joint Publications Research Service, Washington, D.C.

REPORTS ON VARIOUS SOVIET MEDICAL CONFERENCES IN 1962

V. M. Deryabina et al Nov. 13, 1963 37 p Transl. into ENGLISH of 6 articles from Vopr. Kurortol., Fizioterapii i Lecheb. Fiz. Kul't. (Moscow), no. 4, 1963; and Zdravookhr. Tadzhikistana, (Dushanbe), no. 3, 1963

(JPRS-21836; OTS-63-41126) OTS: $1.00

CONTENTS:

1. CONFERENCE ON INTERNAL USE OF MINERAL WATER IN ALIMENTARY AND METABOLIC DISEASES V. M. Deryabina and A. G. Saakyan p 1–10

2. SECOND SCIENTIFIC CONFERENCE ON PROBLEMS OF CLIMATOPATHOLOGY OF CARDIOVASCULAR DISEASES B. I. Soybel' p 10–15

3. THE ALMA-ATA SOCIETY OF SPECIALISTS IN HEALTH RESORTS AND PHYSIOTHERAPY G. P. Turamsheva p 16–18

4. SYMPOSIUM ON SURGICAL TREATMENT OF A CORONARY DISEASE K. T. Tadzhiyev p 19–25

5. QUESTIONS OF PHYSIOLOGY AND PATHOLOGY IN HIGH-ALTITUDE AREAS, USSR K. Yu. Akhmedov and O. G. Lorents p 26–30 (See N64-10516 01-16)

6. SCIENTIFIC SESSION OF THE DUSHANBE INSTITUTE OF EPIDEMIOLOGY AND HYGIENE M. Ya. Rasulov and L. G. Rapoport p 31–34

N64-10516 Joint Publications Research Service, Washington, D.C.

QUESTIONS OF PHYSIOLOGY AND PATHOLOGY IN HIGH-ALTITUDE AREAS, USSR

K. Yu. Akhmedov and O. G. Lorents *In its* Rept. of Various Sov. Med. Confs. in 1962 p 26–30 (See N64-10515 01-16) OTS: $1.00

Brief descriptions of each of several papers presented at a conference devoted to questions of physiology and pathology in high-altitude areas are presented. The purpose of the conference was an exchange of opinions on the study of the actions of high-altitude factors on organisms and generalizations of work conducted in this area. P.V.E.

N64-10517 Joint Publications Research Service, Washington, D.C.

NEW DATA ON CHANGES IN THE CELL SUBSTANCE FROM INJURY AND EXCITATION

D. L. Rozental' and A. S. Troshin Nov. 18, 1963 20 p refs Transl. into ENGLISH from Tsitologiya (USSR), v. 5, no. 4, p 365–378

(JPRS-21894; OTS-63-41150) OTS: $0.50

A review of data on changes in the cell substance after reversible injury and spreading excitation is presented. The experimental material presented, on the whole, confirms the basic principles of the theory of paranecrosis, and makes it possible to more completely characterize the changes in cell substance underlying the tissue reaction to external influences. A comparison of the changes in substance and function made on single nerve fibers has shown that conduction of the nerve impulse may not be accompanied by the same changes in substance as reversible injury. As the result of additional information concerning the increase in stainability by the nonprotein components of the cell and data on the diffusion of light attesting to the occurrence of aggregation of supermolecular complexes under different effects, it is clear that changes in the configuration, not only of the proteins themselves but also of combinations of proteins with one another and other cell substances, underlie paranecrosis. P.V.E.

N64-10551 Naval Research Lab., Washington, D.C. Chemistry Div.

A STUDY OF THE FEASIBILITY OF OXYGEN PRODUCTION BY ALGAE FOR NUCLEAR SUBMARINES

P. J. Hannan, R. L. Shuler, and C. Patouillet Aug. 12, 1963 23 p refs

(NRL-5954; AD-420927)

The feasibility of this method has been investigated in the laboratory by measuring the growth rate and the oxygen production of the Sorokin strain of *Chlorella pyrenoidosa* under various conditions of culture. The results obtained with a small pilot plant containing 6200 ml of algal suspension have been evaluated; the effects of light intensity, rate of stirring, rate of carbon dioxide supply, and other variables were part of this study. Oxygen production increases with light intensity, but the oxygen produced per watt of electrical energy expended is constant over a wide range of light intensities. The amount of electrical energy required to provide enough oxygen for one man is between 30 and 50 kw, depending on the design of the gas exchanger. This high requirement makes the process prohibitive at present, but the development of more efficient high-intensity light sources could change the outlook. The dependability of the algal system in providing a constant supply of oxygen has been assured by this study; also, the volume requirements of the algal system are competitive with existing systems for carbon dioxide removal and oxygen production. Author

N64-10557 Naval Research Lab., Washington, D.C. Chemistry Div.

SOME FACTORS AFFECTING THE OXYGEN PRODUCTION BY ALGAE IN A SMALL CULTURE UNIT

R. L. Shuler Sept. 12, 1963 13 p refs

(NRL-5979; AD-421904)

The performance of an algal culture unit having a 3/4-inch annular culture chamber has been evaluated in terms of its oxygen-producing capabilities. The oxygen production of cultures containing 0.5, 0.6, 0.7, and 1.0 percent of cells was determined at several light intensities. For a given light intensity, the rate of oxygen output was essentially the same for each cell density, indicating that all the cultures were in the linear phase of growth. The experimental results led to

the conclusion that, for cultures in the linear phase of growth, the rate of oxygen evolution is a logarithmic function of light intensity. Author

N64-10558 School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.

A METHOD FOR SELECTING AN ORAL HYGIENE TECHNIC FOR USE IN SPACE CABIN SIMULATOR FLIGHTS

Clarence M. Mc Call, Jr., Lucian Szmyd, Bryce O. Hartman, Billy E. Welch, and Richard E. Mc Kenzie Jan. 1963 12 p refs (SAM-TDR-62-110; AD-403092)

Five oral hygiene techniques were evaluated for use in the USAF space cabin simulator and, ultimately, in actual space missions. The control technique consisted of the use of toothbrush, dentifrice, dental floss, and water rinse. The oral hygiene methods evaluated were: (1) chewing gum only; (2) toothbrush only; (3) toothbrush and dental floss; and (4) toothbrush and water rinse. Each method was tested for ten days. By use of both objective and subjective measurements, the toothbrush and dental floss method was proved to be as effective as the accepted use of toothbrush, dentifrice, dental floss, and water rinse in maintaining good oral hygiene. The degree to which good oral hygiene is maintained depends on the individual. Author

N64-10561 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM VESTNIK RENTGENOLOGII I RADIOLOGII [MOSCOW] VOL. 37, NO. V, 1963

Feb. 8, 1963 25 p refs Transl. into ENGLISH of three articles p 49–54, 55–60, 60–63

(JPRS-17533; OTS-63-20181) OTS: $0.75

CONTENTS:

1. SOME PROBLEMS OF WORK ORGANIZATION AND RADIATION SAFETY IN X-RAY CLINICS V. P. Vikturina and V. I. Gordon p 1–7 refs

2. EKS-60 ELECTROKYMOGRAPH I. K. Tabarovskiy, I. M. Gofman, and A. N. Pomel'tsov p 8–16

3. GENERAL-PURPOSE CAPACITOR DOSIMETER FOR X-RAY AND GAMMA-RADIATION A. N. Krongauz, I. M. Parshin, V. R. Broksh, Yu. D. Gromov, and V. F. Yakunin p 17–22

N64-10564 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM OKISLY MARGANTSA, (MANGANESE OXIDES)

N. V. Lazarev and E. N. Levina, ed. Feb. 11, 1963 26 p refs Transl. into ENGLISH of four selections Leningrad, State Med. Press, 1962 p 3–6, 14–18, 108–110, 153–164

(JPRS-17557, OTS-63-21091) OTS: $0.75

In connection with industrial processes which involve toxic metals, attention was devoted to the prevalence of occupational manganese poisoning and to the hygienic importance of manganese oxides in certain production processes. A series of special hygienic, clinical, and experimental toxicological investigations were carried out. Working conditions under new production processes using manganese were studied. The clinical study of workers in various industries made it possible to detect the presence of a toxic influence of manganese in differing occupational groups. A comparative study was made of the influence of the four oxides containing manganese in the form of bivalent, trivalent, and tetravalent metal under both short- and long-term action on the organism of animals. Also a study was conducted of the pathological, anatomic, and histological changes in certain internal organs and internal secretion glands when poisoned by various manganese oxides. The higher manganese oxides, those containing manganese in the trivalent and tetravalent states, were found to have the greatest toxic effect. C.L.W

N64-10566 Joint Publications Research Service, Washington, D.C.

THE NUCLEOTIDE CODE AND REGULATION OF PROTEIN SYNTHESIS IN THE CELL

I. B. Zbarskiy Feb. 26, 1963 35 p refs Transl. into ENGLISH of an Article from Usp. Sovrem. Biol. (Moscow), v. 54, no. 3 (6), 1962 p 265–284

(JPRS-17811; OTS-63-21200) OTS: $1.00

Data are presented that describe problems of molecular biology associated with the biosynthesis of nucleic acids and proteins. Results were obtained mainly on systems of bacteria and bacterial viruses. The organized cell (animal and plant) is both structurally and metabolically more complicated than the simpler systems; however, indications of the existence of M-RNA in animal cells have been obtained, and it is felt that it is the template for the biosynthesis of a specific protein. R.T.K

N64-10575 Joint Publications Research Service, Washington, D.C.

SOVIET RESEARCH IN RADIATION CONTROL

Petr Nikolayevich Kodochigov Apr. 4, 1963 14 p refs Transl. into ENGLISH of parts of a book "O Prakticheskikh Voprosakh Dozimetrii Ioniziruyuschchikh Izlucheniy", Moscow, USSR Acad. of Sci. Publ. House, 1962 p 23–26, 74–77, 78

(JPRS-18522; OTS-63-21506) OTS: $0.50

Radiation control in connection with professional exposure is reviewed. It is indicated that the idea of the maximum safe dose of exposure of man to ionized irradiation is not altogether successful. During the course of the last twenty years, the dose size has been repeatedly lowered. Formulas are presented for calculating (1) the maximum safe quantity of radioisotopes in the human organism, and (2) the maximum safe concentration of radioactive matter in the air and water. I.v.L

N64-10593 Joint Publications Research Service, Washington, D.C.

RADIOACTIVE CARBON IN HYDROBIOLOGICAL RESEARCH

Yu. I. Sorokin Aug. 13, 1963 7 p Transl. into ENGLISH of an article from Vestn. Akad. Nauk SSSR (Moscow), no. 8, 1963 p 69–71

(JPRS 20614; OTS 63-31515) OTS: $0.50

The use of carbon-14 as a radioactive tracer for the quantitative evaluation of the biological productivity of waterborne bodies is an invaluable aid in tracing the photosynthetic steps of phytoplankton, the synthesis of organic substances and their conversion into food products. It is possible to follow such processes quantitatively, using C^{14}, with an accuracy to within 1×10^{-5}mg. The conclusion is that the radiocarbon method can assist the solution of hydrobiological and hydrochemical problems, particularly the origin of water humus and its trophic role. D.E.F

N64-10595 Joint Publications Research Service, Washington, D.C.

DEVELOPMENT OF AFFERENT AND EFFECTOR INNERVATION OF SOMATIC MUSCULATURE

A. A. Klishov Oct. 11, 1963 21 p refs Transl. into ENGLISH of an article from Arkh. Anat., Gistol. i Embriol. (Leningrad), v. 44, no. 2, Feb. 1963 p 93–102

(JPRS-21415; OTS-63-31921) OTS: $0.50

A survey of the literature devoted to a special study of the development of somatic musculature innervation is presented

The following topics are discussed: (1) the nature of the first movements of animal and human embryos; (2) the development of motor nerve endings (motor plates); (3) the development of sensory nerve endings (neuromuscular spindles and Vater–Pacini corpuscles); and (4) the appearance of heterochronia in the development of afferent and efferent innervation of skeletal musculature. R.T.K.

N64-10596 Joint Publications Research Service, Washington, D.C.

EFFECTS OF IRRADIATION AND DRUGS ON METABOLISM

M. F. Lipkan (Kiev Inst. for Advanced Training of Physicians) et al Oct. 16, 1963 17 p refs Transl. into ENGLISH from Ukr. Biokhim. Zh. (Kiev), v. 35, no. 4, 1963 p 514–518 and 542–547

(JPRS-21472; OTS-63-31948) OTS: $0.50

The nucleic acid (RNA and DNA) content in the tissues of rats and guinea pigs, irradiated and treated with an antiradiation check complex, was investigated. The tissues studied were the mucous membrane of the small intestines, liver, and spleen. The complex consisted of halascorbine, vitamin B_{12}, and streptomycin. Results indicate that: (1) the nucleic acid metabolism does not fully return to normal during the period of attenuation of the reactions produced by irradiation; (2) the nucleic acid content in the walls of the small intestines becomes normalized earlier than in the liver and spleen; and (3) the introduction of the complex produces a substantial overall normalizing effect with respect to the nucleic acid content. Also, the effect of ipraside on the nitrogen metabolism of the rabbit brain was investigated. Results are as follows: (1) the subcutaneous injection of ipraside in doses of 100 mg/kg of body weight does not alter the ammonia nitrogen or the amide nitrogen content of the proteins for 17 hrs; the glutamine level in the brain decreased by 30% as compared to that of normal animals; (2) a rise in the acetylcholine level in the brain does not affect the content of the nitrogen-metabolism investigated fractions; (3) intracisternal introduction of glutamic acid lowers the brain ammonia level, raises the glutamine content that was lowered by the ipraside, and reduces it to the level observed in the control animals. I.v.L.

N64-10597 Joint Publications Research Service, Washington, D.C.

ACCLIMATIZATION OF MAN TO THE NORTH AND SOUTH

I. A. Arnol'di Oct. 17, 1963 62 p Transl. into ENGLISH of the book "Akklimatizatsiya Cheloveka na Severe i Yuge", Moscow, State Publ. House for Med. Lit., 1962 p 1–17

(JPRS-21481; OTS-63-31954) OTS: $1.75

Brief information is given on hygiene, living conditions, and diet which must be taken into consideration for preventing harmful effects from the unusual conditions of extreme hot and extreme cold climates. P.V.E.

N64-10599 Joint Publications Research Service, Washington, D.C.

OUTER SPACE AND LIFE

A. A. Imshenetskiy Nov. 22, 1963 12 p Transl. into ENGLISH from Vestnik Akad. Nauk SSSR (Moscow), no. 9, Sept. 1963 p 23–29

(JPRS-22015; OTS-63-41224) OTS: $0.50

The majority of biologists believe that heterotrophic bacteria, if not the first kind of life, in any case occurred before the autotrophs. Therefore, a search for microorganisms on other planets should begin with attempts to detect heterotrophic bacteria by creating, in the instruments sent up, conditions for the reproduction of as large a number as possible of species which utilize organic matter. The second stage should be connected with a search for chemoautotrophic microorganisms which oxidize hydrogen, methane, ammonia, sulfur, iron, etc., because, according to existing data, these elements and compounds frequently exist in considerable quantities on various planets. The third stage should consist of a search for photosynthesizing bacteria which carry out anaerobic photosynthesis. Methods for detecting life, such as nephelometry and manometry are discussed. Also, investigations in which conditions existing in outer space are reproduced in laboratories, and a study of the effect of these conditions on various living organisms are discussed. I.v.L.

N64-10600 Joint Publications Research Service, Washington, D.C.

OUR EXPERIENCE IN REVIVING AN ORGANISM FROM A STATE OF CLINICAL DEATH

K. Stoyanov et al (Higher Mil.-Med. Inst., Bulgaria) Nov. 29, 1963 9 p Transl. into ENGLISH from Khirurgiya (Sofia), no. 9, Sept. 1963 p 10–14

(JPRS-22013; OTS-63-41222) OTS: $0.50

Clinical death in patients supervened predominantly during operations on the lungs and heart. For the resuscitation of patients the following measures were employed: controlled respiration, massage of the heart, intra-arterial blood transfusions, intravenous transfusions (blood, glucose, antishock fluids, analeptics, etc.), intracardiac injections (adrenaline, noradrenaline, calcium chlorate), defibrillation, and stimulation of the heart with the aid of a pulser. As a result of reanimation, out of 45 clinical observations 20 patients recovered completely, 17 patients recovered partially, 3 resuscitated patients had manifestations of decerebration, whereas in 5 cases the reanimation complex was of no avail. Subsequently, 3 resuscitated patients succumbed to the principal affection. Based upon the experience gained in recent years, the authors consider cardiac massage, controlled respiration, adequate blood substitution, and defibrillation as the principle means of reanimation. Author

N64-10616 Rochester U., N.Y.

THE TRANSFER OF STRONTIUM-90 THROUGH MILK TO SUCKLING MONKEYS AND RATS

B. J. Hopkins, S. A. Goksel, and L. W. Tuttle Dec. 11, 1963 20 p refs

(Contract W-7401-eng-49)

(UR-635)

Three rhesus monkeys were given 500 microcuries of Sr^{90} orally in 30 daily doses. Seven days after the last dose, they contained 10.37 ±0.24, 14.80 ±0.48 and 20.45 ±0.63 microcuries of Sr^{90} or from 2 to 4 percent of the total dose given to the mothers. Long-term retention of the milk-transferred Sr^{90} was measured through 600 days' postweaning. Rats of the Long–Evans strain were injected intravenously with 382 microcuries on day 17 postconception. A body burden of more than 1.3 microcuries was retained from the milk on day 14 postbirth when offspring body burden was at a maximum. This was in addition to 1.49 microcuries due to placental transfer that was present at birth. Long-term retention in rats was measured through 300 days' postweaning. The slopes of the retention curves of strontium for weanling animals are similar in monkeys and rats. Author

N64-10621* Library of Congress, Washington, D.C. Science Technology Div.

AEROSPACE MEDICINE. ABSTRACTS OF CURRENT LITERATURE

Arnold J. Jacobius and Roman Kenk, ed. Repr. from Aerospace Med. v. 34, no. 11, Nov. 1963 p 121–132

(Supported by NASA)

Abstracts of articles appearing in current literature dealing with aerospace medicine are presented under the following headings: (1) general aspects, (2) biology, (3) general physiology, (4) neuro and sensory physiology, (5) psychology and psychiatry, (6) environmental physiology and psychology, (7) personnel, (8) medical problems and pharmacology, (9) toxicology, (10) safety, survival, and rescue, and (11) man–machine integration and life-support systems. P.V.E.

N64-10629 Joint Publications Research Service, Washington, D.C.

TELEMETRY PROBLEMS AT THE SECOND ALL-UNION CONFERENCE ON THE USE OF RADIOELECTRONICS IN BIOLOGY AND MEDICINE

R. A. Kapitanov Feb. 15, 1963 8 p Transl. into ENGLISH of an article from Med. Prom. SSSR (Moscow), v. 16, no. 11, 1962 p 62–64

(JPRS-17672; OTS-63-21144) OTS: $0.50

Telemetry problems to be solved in the course of medical and biological investigations are discussed. These problems are as follows: (1) the placement of the pickups, (2) the efficient setup of multichannel systems for the simultaneous transmission of information from several subjects (concentrated or scattered), (3) the rapid processing and evaluation of the biological information received, (4) the creation of a feedback from the investigator to the subject under investigation, and (5) the unification and standardization of telemetric apparatus units. I.v.L.

N64-10643 Joint Publications Research Service, Washington, D.C.

HISTORY, NATURE, AND THEORY OF ASTROBIOLOGY

K. A. Lyubarskiy Apr. 16, 1963 19 p refs Transl. into ENGLISH of two chapters of a book "Ocherki po Astrobiologii", Moscow, 1962 p 5–11, 104–111

(JPRS-18724; OTS-63-21584) OTS: $0.50

The possibility of extraterrestrial life and the multiplicity of inhabited worlds are discussed. The history and nature of the problems are studied, including a review of the hypotheses pertaining to extraterrestrial life formulated through the work of various investigators, and followed by some general theoretical questions. C.L.W.

N64-10647 Joint Publications Research Service, Washington, D.C.

THEORETICAL ASPECTS OF THE CHEMICAL PROTECTION OF MAMMALS FROM IONIZING RADIATION

E. Ya. Grayevskiy Apr. 26, 1963 27 p refs Transl. into ENGLISH of an article from Zh. Obshch. Biol. (Moscow), v. 24, no. 1, 1963 p 3–22

(JPRS-18918; OTS-63-21688) OTS: $0.75

Chemical protection of mammals from the harmful consequences of ionizing radiation is investigated from a theoretical point of view. Radiation protective substances are discussed along with manifestations and criteria of the protective effects and operation of the protective substances. Two mechanisms of protection associated with the intervention of the initial (physicochemical) stages of radiation injury have been accepted. The first mechanism involves a decrease in radiosensitivity as a result of a decrease in oxygen tension in the organism, and the second mechanism involves an abatement of radiation injury as a result of a chemical combination of the protector and the components of intracellular structures. C.L.W.

N64-10650 Joint Publications Research Service, Washington, D.C.

AUTOMATS, LIFE, AND CONSCIOUSNESS

Todor Pavlov May 16, 1963 14 p Transl. into ENGLISH of an article from Nauchn. Dokl. Vysshey Shkoly Filosofskiye Nauki (Moscow), no. 1, 1963 p 49–57

(JPRS-19231; OTS-63-21834) OTS: $0.50

The possibility of man, with the aid of science, creating a live being which would manifest all signs of a live being, including sensation, experience, emotion, and will is discussed. In this report, it is concluded that science, in principle, may one day create (especially after mastering space and atomic energy) live, artificial human beings. This task will not be solved by cybernetics, physical, and chemical means and methods alone without the necessary aid of the biological and social sciences, including the communist scientific world outlook, Marxism-Leninism, and dialectical materialism. I.v.L.

N64-10658 Joint Publications Research Service, Washington, D.C.

THE ALGORITHMIC STRUCTURE OF ACTIVE TOUCH

June 5, 1963 19 p refs Transl. into ENGLISH of an article from Voprosy Psikhologii (Moscow), no. 1, 1963 p 67–7[illegible]

(JPRS-19565; OTS-63-21985) OTS: $0.50

The macromovements of active touch are considered to be a form of scanning, allowing the concepts of cybernetics to be used for a theoretical analysis of the structure of active touch. The processes occurring in the brain during touch are regarded as information handling processes, in accordance with particular algorithms; the problem was reduced to the discovery of these algorithms. The structure of information handling processes in active touch is discussed as follows: (1) the problem of search for the object of perception—the solution of the problems of adjusting the algorithms and matching of the coordinate system of the hand with the object; (2) investigative movements of the feeling hand—the discrimination of the parts of the object surface which can be described by simple functions to determine their boundaries and characteristics; (3) the problem of recognition—identification of the perceived object with an object perceived earlier. R.T.I.

N64-10664 Joint Publications Research Service, Washington, D.C.

HISTOCHEMICAL CHARACTERIZATION OF THE DISTRIBUTION OF RIBONUCLEIC (RNA) AND DEOXYRIBONUCLEIC (DNA) ACIDS IN THE TESTICLES OF RATS AFTER GAMMA IRRADIATION WITH Co^{60}

A. K. Mirakhmedov Nov. 22, 1963 7 p refs Transl. into ENGLISH of an article from Akad. Nauk UzSSR, Uzbeksk. Biol. Zh. (Tashkent), v. 7, no. 4, 1963 p 55–58

(JPRS-22017; OTS-63-41226) OTS: $0.50

The results of an investigation of the effect of gamma irradiation on the histological and histochemical structures of the sex glands of white male rats, exposed to single whole body irradiation with a total dose of 400 r, are discussed. Results include the following: (1) the weight decrease of the testicles increased with irradiation duration; (2) the minimum weight of the testicles was noted two months after the beginning of irradiation; (3) histological examination of the testicles one day after irradiation showed a dilatation of the blood vessels, accumulation of lymphocytes in the blood vessel lumina and slight hemorrhages in various parts of the sections; (4) a reduction in the RNA and DNA content was observed, most noticeably two months after the beginning of irradiation; and (5) degenerative changes, to the point of disappearance of the germinal epithelium and depletion of the tubules, were noted on the 60th day after irradiation. P.V.[illegible]

N64-10666 Rochester U., N.Y. Div. of Radiation Chemistry and Toxicology
THE FUNCTIONAL SIGNIFICANCE OF SULFHYDRYL GROUPS IN THE CELL MEMBRANE
Aser Rothstein and Robert I. Weed Nov. 29, 1963 39 p refs (Contract W-7401-eng-49; Grant HE-06241-02)
(UR-633) OTS: $1.00

Evaluation of the functional significance of sulfhydryl groups in the cell membrane depends in part on certain unpredictable properties of protein sulfhydryl groups. These include: (1) problems of specificity related to sulfhydryl reacting reagents used to determine sulfhydryl content, (2) relative reactivity of the sulfhydryl groups themselves, (3) existence of functionally unresponsive sulfhydryl groups, along with those essential for the physiological activity under study. In studies of membranes, problems of distribution and permeation of the sulfhydryl reagents provide additional complications. Author

N64-10668* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN INTERPRETATION OF BETA LYRAE
Su-Shu Huang Repr. from Astrophys. J., v. 138, no. 2, Aug. 15, 1963 p 342-349 refs
(NASA RP-78)

To explain the peculiar spectroscopic and photometric behavior of the B-Lyrae system, a model in which the primary component is assumed to be the less massive of the two components has been constructed. A theory of emission lines that predicts a redshifted peak superimposed on a broad emission line has been proposed. The observed shift in the γ-velocity of the emission peaks is thereby understood. The evolution of the component stars leading to the present situation is discussed. Author

17 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; and materials fabrication, handling and inspection. *For related information see*: 06 Auxiliary Systems.

N64-10140* Thompson Ramo Wooldridge, Inc., Cleveland, Ohio Tapco Div.
BRAYTON CYCLE CAVITY RECEIVER DEVELOPMENT Quarterly Report, July 1963-Sept. 1963
1963 36 p refs
(NASA CR-52390; ER-5579) OTS: $3.60 ph, $1.28 mf

Results of a preliminary design analysis of a flightweight Brayton cycle cavity receiver, which uses lithium fluoride as the heat storage medium and argon as the inert gas working fluid, are presented. Preparations are being made for materials compatibility investigations using lithium fluoride as the corrosive salt, and for small-scale tests to determine the fluoride thermal conductivity of both the liquid and the solid in the vicinity of the melting point to determine the heat input rates that can be attained. M.P.G.

N64-10249 Air Force Systems Command, Wright-Patterson AFB, Ohio
A LABORATORY STUDY OF THE ANTIOXIDATION EFFECTIVENESS OF MOTOR-OIL ADDITIVES
K. S. Rayaya, M. S. Borovaya, and R. Kh. Sil's Jan. 10, 1963 10 p Transl. into ENGLISH from Prisadki k Maslam i Toplivam (Moscow), 1961 p 269-272
(FTD-TT-62-1324/1+2+4; AD-295825)

A comparison and interpretation of results of three different methods of ascertaining the antioxidation effectiveness of motor-oil additives are presented. The criterion for appraising the extent of oxidation of the motor oils in two of the methods is the amount of sediment (the oxidation products) not soluble in light gasoline; in the third method, the criterion is the amount of absorbed oxygen. The results of experimentation with the three methods indicate that final and comprehensive data concerning the antioxidant and oxidant effects of motor-oil additives must be obtained by methods based on absorption of oxygen at high temperatures. R.T.K.

N64-10316 Weapons Research Establishment (Australia)
ABLATIVE COATINGS FOR SHORT TERM THERMAL PROTECTION
T. E. Richards and J. R. Baxter May 1963 43 p refs
(CPD-57)

A range of coatings consisting of organic resin and inorganic heat absorbing fillers for the thermal protection of surfaces exposed to a high-temperature gas stream for a short time has been investigated. Coating performance was measured during exposure to both high and low velocity flows of high-temperature gas. A performance considerably superior to that of the asbestos-phenolic material "durestos" was achieved with a number of compositions, all of which cure at room temperature. The physical nature of the char produced was found to have a major effect on performance. A coherent char with a low thermal conductivity has a high surface temperature with the result that transfer is reduced and radiation loss increased. A bulky highly porous char was effective under low gas velocity conditions, but a strong char was essential for good performance under the high velocity conditions used. Author

N64-10325 Joint Publications Research Service, Washington, D.C.
ELECTROSLAG WELDING APPLICATIONS
G. V. Nazarov and Yu. N. Zaytsev Oct. 17, 1963 Transl. into ENGLISH of 2 articles from Svarochnoye Proizvodstvo (Moscow), no. 8, 1963 p 22-28 refs
(JPRS-21485; OTS-63-31955) OTS: $0.50

CONTENTS:
1. ELECTROSLAG WELDING OF SHIP PARTS G. V. Nazarov p 22-25 7 refs
2. ELECTROSLAG WELDING OF PRESS SHAFTS WITH A PLATE ELECTRODE Yu. N. Zaytsev p 25-28

N64-10353 Joint Publications Research Service, Washington, D.C.
BASIC DIRECTIONS IN RELIABILITY THEORY
N. G. Bruyevich and V. Grabovetskiy Nov. 19, 1963 13 p refs Transl. into ENGLISH from Priborostroyeniye (Moscow), no. 8, Aug. 1963 p 3-6
(JPRS-21923; OTS-63-41169) OTS: $0.50

The theory of reliability is discussed. It has been found that for some machines, reliability consists of continuous and precise operation during a specified interval of time. For others, reliability is this criterion plus the ease of repair. Any machine or system is optimal when it assures the greatest machine probability under the influence of mild primary errors. Various

tests for reliability are discussed, and it is found that the basic factor for all such tests is the assembling of statistics on machine failures. The relationship between reliability and service life, the capacity of machines for maintaining their serviceability under specified conditions, is explained. Then the ways of improving reliability, by building reliability into the components, by increasing repairability, by improving design principles, and by maintaining a stockpile of spare parts, are discussed. D.E.R.

N64-10354 Joint Publications Research Service, Washington, D.C.
BRAZING WITH HIGH-TEMPERATURE SOLDERS
V. A. Gorokhov and M. I. Skripov Nov. 19, 1963 13 p Transl. into ENGLISH from Vestnik Mashionstroyeniya (Moscow), no. 7, 1955 p 47-5
(JPRS-21927; OTS-63-41172) OTS: $0.50

An investigation of the basic properties of compounds from Ya1T steel and KhN78T alloy brazed with three high-temperature solders (No 1 copper base with nickel and manganese, No 2 copper base with silicon, beryllium, zinc, and iron, and No 3 nickel base with chromium) is discussed. Metallographic analysis indicates that there is a mutual diffusion of the solder and the basic material. With tempering of the soldered compounds, a homogeneous solid solution was formed which had good cohesion with the basic material. Intercrystalline corrosion tests indicated that compounds of Ya1T steel and KhN78T alloy (soldered with No 3) had high resistance to intercrystalline corrosion. During prolonged heat resistance tests at 600° (YA1T) and 800° (KhN78T), all samples broke down with respect to the basic metals. Fatigue tests indicated that tests of soldered samples for stretching under a cyclic load give a better picture of the fatigue resistance of a soldered compound than do tests for alternate bending. P.V.E.

N64-10366 Bettis Atomic Power Lab., Pittsburgh, Pa.
CLEANING ZIRCALOY COMPONENTS FOR PRESSURE BONDING
J. Weber, R. Lloyd, and W. L. Frankhouser Sept. 1963 40 p refs
(Contract AT(11-1)GEN-14)
(WAPD-TM-375) OTS: $1.00

A series of laboratory experiments in bonding Zircaloy resulted in a combination recommendation of (1) cleaning procedures and materials, and (2) an abrasion coolant for prior surface conditioning compatible with ease of surface film removal during subsequent cleaning operations. The laboratory experiments included independent investigations of cleaning procedures and materials, and of cutting fluids, and a final interrelated experiment in the shop combining cleaning variables with cutting fluids. Author

N64-10387 Joint Publications Research Service, Washington, D.C.
THE EFFECT OF SLAG COMPOSITION ON THE MELTING OF AN ELECTRODE OF LARGE CROSS SECTION IN THE ELECTROSLAG PROCESS
Yu. V. Latash and G. S. Tyagun-Belous Nov. 21, 1963 17 p refs Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 12 (69), 1958 p 17-27
(JPRS-21983; OTS-63-41198) OTS: $0.50

A study is made of the effect of the composition of a CaF_2-Al_2O_3 slag on the yield and specific power consumption in the electroslag melting of an electrode of large cross section. Results are presented of the measurements of the temperature and the electrical conductivity of the slag, as well as oscillographic analysis of the process. Author

N64-10450 European Atomic Energy Community, Brussels (Belgium)
ON THE WORKABILITY OF SAP-ISML WITH PARTICULAR REGARD TO EXTRUSION AND DRAWING OF THIN-WALLED TUBINGS [SULLA LAVORAZIONE PLASTICA DEL SAP-ISML CON PARTICOLARE RIFERIMENTO ALL'ESTRUSIONE E TRAFILATURA DEI TUBI A PARETE SOTTILE]
C. Belvedere Novara, Italy, Instituto Sperimentale Dei Metalli Leggeri 1963 44 p refs In ITALIAN; ENGLISH Summary Presented at the X Convegno Nazl. della Assoc. Ital. di Met., Naples, Sept. 22-26, 1963 and Brussels, Sept. 1963
(Contracts EURATOM 003-60-5 ORGI and 026-61-7 ORGI) (EUR-428.i) Available from the Belgian American Bank and Trust Co., N.Y., account no. 121.86: 60 Bel. Fr.

After an introductory survey regarding the general characteristics, work schedule, and the possible uses of SAP, results are reported of the research carried out on pilot scale operation of SAP-ISML: extrusion, drawing and rolling. Experimental results are reviewed for correlation and characteristics of the principal extrusion variables. Author

N64-10495 Joint Publications Research Service, Washington, D.C.
THE FEDERAL ASSOCIATION OF THE GERMAN AERO-SPACE INDUSTRY
Mar. 11, 1963 76 p refs Transl. into ENGLISH of a booklet "Der Bundesverband der deutschen Luft und Raunfahrtindustrie", Duesseldorf, Walter Rau Verlag, 1962 p 1-10
(JPRS-18055) OTS: $2.00

The course of important developments in the German aircraft industry is described, and the present status of the German aerospace industry is analyzed. The discussion extends from reconstruction of the German aircraft industry through progress in space technology, and includes airframe construction, engine building, repair and overhaul, and aviation equipment. C.L.W.

N64-10509 Joint Publications Research Service, Washington, D.C.
THE MANUFACTURE OF SPUR GEARS BY ROLLING
V. A. Bodazhkov, P. F. Filippov, V. V. Polovnikov, G. G. Sembratov, and V. S. Smirnov, ed. May 20, 1963 299 p refs Transl. into ENGLISH of a book "Izgotovleniye Tsilindricheskikh Zubchatykh Koles Prokatkoy", Moscow-Leningrad, State Sci. and Tech. Pub. House of Machine Bldg. Lit., 1961 p 2-186
(JPRS-19273; OTS-63-21856) OTS: $4.00

A book on the manufacture of spur gears by rolling is presented covering the following topics: (1) principal parameters of gear train and the effect on quality of operation of gears, (2) principal of plastic deformation of metals and of calibration of rolls in rolling gears, (3) construction of mills for rolling gears, (4) induction heating during rolling of gears, (5) technology of manufacturing gears by hot rolling, (6) KzTZ-Niitvch technological process for hot and cold rolling of gears, (7) cold rolling of gear teeth, (8) metallographic, laboratory, and exploitational testing of rolled gears, and (9) perspectives of development of gear rolling. P.V.E.

N64-10559 Joint Publications Research Service, Washington, D.C.
NEW METHODS FOR THE LINING OF METAL PIPES WITH PLASTIC
A. A. Shturman Feb. 5, 1963 6 p refs Transl. into ENGLISH of an article from Mashinostroyeniye (Moscow), no. 3, 1962 p 79-81
(JPRS-17468; OTS-63-21050) OTS: $0.50

A new method for the lining of steel tubes with vinyl plastic has been developed. This method involves the insertion of a vinyl plastic tube into the steel tube, leaving a gap of 3 to 4 mm which is then filled with a cold-setting plastic composition. This cold-setting plastic composition consists of a separately stored powder and liquid. The powder consists of an emulsified polymethyl methacrylate containing 1.5% benzoyl peroxide as a polymerization catalyst. The liquid consists of methyl methacrylate (82%), methacrylic acid (15%), and 3% dimethyl amiline as an initiator. The composition is prepared for use as follows: The powder and liquid are mixed in a ratio of 1:1 or 08:1. After thorough mixing, the composition is left to swell in a closed container, and after 3 to 4 minutes (when the mass is fluid) it is poured into the space between the tubes. This method may find wide application in the chemical industry, and also in mechanical engineering in general, both in experimental and production work, as well as in the repair of apparatus and equipment. I.v.L.

N64-10560 Joint Publications Research Service, Washington, D.C.
SCIENTIFIC SEMINAR ON PNEUMATIC-HYDRAULIC AUTOMATION
A. I. Semikova Feb. 5, 1963 10 p refs Transl. into ENGLISH of an article from Automat. i Telemekh. (Moscow), no. 12, Dec. 1962 p 1720–1723
(JPRS-17469; OTS-63-21051) OTS: $0.50

A brief review of the All-Union seminar on pneumatic–hydraulic automation held in Leningrad in June, 1962 is presented. A description of some of the papers presented is also given. P.V.E.

N64-10589 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS ON WELDING
S. T. Nazarov et al June 18, 1963 22 p refs Transl. into ENGLISH of 3 articles from Svarochnoye Proizvodstvo (Moscow), no. 4, 1963 p 19–31
(JPRS-19715; OTS-63-22058) OTS: $0.50

The results of studying the sensitivity of the X-ray method of controlling aluminum, titanium, and steel using electronic image translators are discussed. The advantages of modern roentgenoscopy over roentgenography in the industrial control of welded products are demonstrated. Conclusions drawn from the results include: (1) Making the transition from roentgenography to mechanized roentgenoscopy with the aid of image-converter tubes (ICT) is possible; the sensitivity to welding defects remains practically the same; and (2) with the aid of ICT's, the maximum defect-detections sensitivity is attained with light alloys. P.V.E.

N64-10633 Joint Publications Research Service, Washington, D.C.
HOT PRESSING TECHNOLOGY IN THE SOVIET MACHINE BUILDING AND METALLURGICAL INDUSTRIES, USSR
G. V. Samsonov and M. S. Koval'chenko Feb. 25, 1963 319 p refs Transl. into ENGLISH of the book "Goryacheye pressovaniye" Kiev, State Publ. House of Tech. Literature, 1962
(JPRS-17790; OTS-63-21192) OTS $5.00

This book presents information on the production of articles from refractory metals and compounds, hard alloys, and also ferrous and nonferrous metals, by hot pressing powders. Besides describing the technological processes, the book describes the design of the presses and gives examples of the use of hot pressing in various branches of industry. Author

N64-10652 Joint Publications Research Service, Washington, D.C.
EXPERIMENTAL METAL-CERAMIC ROLLING MILL
G. A. Vinogradov and I. M. Fedorchenko May 17, 1963 7 p Transl. into ENGLISH of an article from Poroshkovaya Met. (Kiev), no. 2, 1961 p 101–107
(JPRS 19253; OTS 63-21846) OTS: $0.50

A description is presented of the first experimental metal-powder rolling mill built in the U.S.S.R. The mill is intended for laboratory investigations and for industrial use in production of metal-powder porous and nonporous rolled stock for various uses. The mill consists of a breaking-down stand, two finishing stands, and reelers. The breaking-down stand is intended for rolling a metal tape from powder and for rolling blanks in a protective gaseous medium. The first finishing stand has a roll barrel length of 250 mm, and the second has one of 200 mm. P.V.E.

18 MATERIALS, METALLIC

Includes cermets; mechanical and physical properties of alloys and metals; and metallurgy. *For related information see*: 07 Chemistry; 17 Machine Elements and Processes; 19 Materials, Nonmetallic; 33 Stresses and Loads; and 34 Structural Design.

N64-10088* General Electric Co., Cincinnati, Ohio Materials Development Lab. Operation
RESEARCH ON ANALYTICAL METHODS FOR OXYGEN IN LIQUID ALKALI METALS Final Report, April 1, 1963–Aug. 31, 1963
H. Kirtchik and T. Lajcik Sept. 30, 1963 33 p refs
(NASA Contract NASr-12)
(NASA CR-52184; DM-63-233) OTS: $3.60 ph, $1.19 mf

Results reported include the following: (1) the feasibility of developing a specific method for the analysis of traces of oxygen (5 to 150 ppm) in alkali metals has been established. The method is based on the reaction of purified BrF_3 with the subject metal to liberate molecular oxygen, which is then dynamically determined by the Brady method; (2) an apparatus has been designed and constructed to purify and accommodate the BrF_3 in a reaction system and to sweep, with purified helium, the liberated oxygen to a spectrophotometric measuring instrument; (3) excellent recoveries of oxygen were obtained when test samples of $KBrO_3$, containing between 25 to 150 micrograms of oxygen, were reacted with BrF_3. Thus, the BrF_3 method is applicable for analytical purposes at concentration levels as low as three-orders-of-magnitude less than has been previously reported. I.v.L.

N64-10123 Joint Publications Research Service, Washington, D.C.
THE EFFECT OF ELECTROSLAG REMELTING ON THE TECHNICAL PLASTICITY OF IRON-NICKEL-CHROMIUM BASE ALLOYS, USSR
M. V. Pridantsev, I. G. Sokolov, and A. I. Kondrat'yev Nov. 6, 1963 11 p refs Transl. into ENGLISH of an article from Automat. Svarka (Kiev, USSR), no. 3(120), 1963
(JPRS-21760; OTS-63-41080) OTS: $0.50

The results of comparative studies of the heat-resistant EI787 alloy produced in the usual way and subjected to electroslag remelting are presented. The mechanical properties and technical plasticity of the metal were studied in the 20° to

1200° temperature interval. This alloy has an iron–nickel–chromium base, is used in critical parts, and is a substitute for certain nickel-base heat-resistant alloys. Electroslag remelting was found to expand the temperature interval of EI787 alloy deformation twofold in comparison with ordinary smelting metal; the technical plasticity was found to be 10% to 15% higher, and the specific resistance to deformation 15% to 30% lower than that of conventional-smelting metal. The more favorable conditions of electroslag metal forming were due to the reduced content of nonmetallic admixtures and the peculiarities of the dendrite structure of the ingots. R.T.K.

N64-10124 Atomic Energy Establishment, Bombay (India) Analytical Div.
DETERMINATION OF METALLIC THORIUM IN SLURRIES
S. P. Awasthi and K. A. Khasgiwale 1963 10 p refs
(AEET/Anal./20)

A eudiometric method for determination of metallic thorium has been developed using fluoride-catalyzed hydrochloric acid for dissolution. The method is useful in a wide range of concentrations of metallic thorium with an accuracy of ±0.7% at 95% confidence level. This method has been applied to samples of thorium metal and slurries. Author

N64-10145 Deutsche Versuchsanstalt für Luft- und Raumfahrt, Aachen (W. Germany) Inst. für Werkstoff-Forschung
ON THE NOTCH-SENSITIVITY OF ALUMINUM ALLOYS IN COMPARISON WITH STRUCTURAL STEELS [ZUR KERBEMPFINDLICHKEIT VON ALUMINIUM-LEGIERUNGEN IM VERGLEICH ZU BAUSTAHLEN]
F.-C. Althof and G. Wirth [1963] 18 p refs In GERMAN Presented at the Ann. Meeting of the Wissenschaftliche Gesellschaft für Luft- und Raumfahrt, Munich, Oct. 8–12, 1963
(Sponsored by Deutsche Forschungsgemeinschaft)

The stress-concentration index of various aluminum alloys as compared to the same index of structural steels was investigated. Notched-bar tensile strength, notched-bar impact tensile-strength tests, and fatigue tests were conducted. Results indicate that: (1) the tensile strength of all specimens, under increasing notch depth, increased as a result of the increase of the transverse-strain restraint; (2) notched-bar impact tensile-strength data and fatigue test data showed aluminum alloys to be more brittle than steel alloys. I.v.L.

N64-10173 Joint Publications Research Service, Washington, D.C.
AN INVESTIGATION OF SOME CONDITIONS FOR HOT ROLLING MOLYBDENUM IN A VACUUM, IN AN ARGON ATMOSPHERE, AND IN AIR, USSR
I. M. Pavlov, Ya. B. Gurevich, A. Ye. Shelest, V. L. Orzhekhovskiy, and A. P. Bashchenko Nov. 6, 1963 10 p refs Transl. into ENGLISH of an article from Tsvetn. Metal. (Moscow), no. 2, 1963
(JPRS-21757; OTS-63-41078) OTS: $0.50

This investigation covered the geometric conditions, power requirement, and rolling speed conditions for the hot rolling of molybdenum in a vacuum of about 10^{-5}mm Hg, in an inert gas (argon) and in air, using technically pure molybdenum, which had been melted in an arc furnace and forged at 1000° to 1300° C into billets of 16 × 16 mm section. This investigation resulted in certain qualitative and quantitative relationships between the power required and the geometric conditions for the hot rolling of molybdenum, that may be used in the selection of processes, in the design of mills and heating equipment, and also in the calculation of the roll grooving for the deformation of molybdenum and its alloys. The high-temperature deformation of molybdenum and its alloys in a vacuum or in an inert atmosphere has favorable effects on their properties since there is no oxidation or saturation by active gases which causes brittleness. In addition, the loss of metal by oxidation is prevented. I.v.L.

N64-10176* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
LIQUID METALS FOR AEROSPACE ELECTRIC-POWER SYSTEMS
L. Rosenblum Repr. from J. of Metals, Sept. 1963 5 p refs Presented at the Fall Meeting of the Met. Soc., New York

Liquid metals and their properties, as applied to space electric-power systems, are discussed as possible heat-transfer and thermodynamic working fluids. Representative liquid metals—lithium, sodium, potassium, NaK-78, lead, and bismuth—are discussed and compared. Space power requirements are listed and used as a basis for evaluating the potentialities of the liquid metals. Author

N64-10185 California U., Berkeley, Lawrence Radiation Lab.
ANNEALING OF VACANCIES IN QUENCHED ALUMINUM-MAGNESIUM ALLOY
Alf Kenneth Eikum Sept. 1963 38 p refs
(Contract W-7405-eng-48)
(UCRL-10879) OTS: $0.75

Vacancy climb of prismatic helicoidal dislocations and prismatic dislocation loops in aluminum-5 w/o magnesium was studied using transmission electron microscopy. From both bulk annealing and thin-foil heating stage experiments the magnesium-vacancy binding energy E_b was estimated to be 0.10 to 0.20 ev. Helices and loops appear to grow in the foils just as they do in bulk specimens, which is possible if local vacancy supersaturation can be maintained around the climbing dislocations. Above 250° C, loop growth can be described by an activation energy, $E_{(r)} = 0.95 \pm 0.05$ ev, which leads to a value of E_b of the order of 0.10 to 0.20 ev. The estimated binding energy accounts for the supersaturation. Author

N64-10186 California U., Berkeley. Lawrence Radiation Lab.
THE INTERNAL FRICTION DUE TO OXYGEN IN SILVER
John Mesrob Papazian (M.S. Thesis) Sept. 1963 59 p refs
(Contract W-7405-eng-48)
(UCRL-11017)

The presence of oxygen in amounts of the order of 100 ppm in high-purity silver is found to give rise to three low-temperature internal-friction peaks. A study has been made of the orientation dependence of the peaks, the variation in the peak heights with oxygen concentration and the response of these peaks to various annealing treatments. It is shown that for both 130° and 180° peaks the peak height is proportional to the square of the oxygen concentration over the range from 100 to 300 ppm. For both peaks, the maximum relaxation strength is observed when the crystals are tested in torsion about a <111> axis, while torsion about <100> results in minimum values of the peak heights. On the basis of these observations and others, the 130° K peak has been assigned to the stress-induced reorientation of interstitial oxygen atom pairs whose axes lie along <110> directions. It is proposed that the defect responsible for the 130° K peak consists of a pair of oxygen atoms in a vacant lattice site in the split interstitial configuration. Author

N64-10242 Franklin Inst., Philadelphia, Pa. Labs. for Research and Development
THE FLOW AND FRACTURE OF ZONE REFINED TUNGSTEN
Quarterly Progress Report, Jan. 1, 1963–Mar. 31, 1963

John R. Wiese 1963 13 p refs
(Contract DA-36-034-ORD-3747-RD)
(Q-B1973-3; WAL-TR-834.2/11-2; AD-293877)

Zone-refining efforts have been directed toward enhancing the control of the zone. These efforts have included additional coil designs, effect of atmosphere gas velocities, and zone-refining while power fluctuations were at a minimum. Resistivity ratios have been determined on two as-received electron-beam zone-refined single crystals of tungsten. A description of the measuring resistivities by an eddy-current method is described briefly. Author

N64-10243 Watertown Arsenal, Mass.
EVALUATION OF CO-REDUCED DEPLETED URANIUM ALLOY
Ernest N. Kinas and F. J. Rizzitano Mar. 1963 12 p refs
(WAL TR-420.5/1; AD-401158)

A study was conducted to determine the advantage of forging depleted uranium components directly from coreduced dingot stock. Two types of alloys were investigated: U-8% Mo and U-8% Mo-1% Ti. To provide a basis of comparison, some of the coreduced dingot stock was remelted into ingots and was hot worked in the same manner as the material from the dingot. Mechanical properties were obtained to determine the effect of both methods. Photomicrographs and photomacrographs were obtained to compare the effect of different processing methods and heat treatments on metallurgical structure. The hot-working methods used were upset forging and cogging. Data obtained from this investigation indicated that coreduced material could be forged and heat treated directly to give good combinations of mechanical properties. Remelting of coreduced hot-working material followed by hot working resulted in only slightly higher yield strength. Author

N64-10245 Watertown Arsenal Labs., Mass.
METALLURGICAL ASPECTS OF FRACTURE AT HIGH STRENGTH LEVELS Final Technical Report
Walter A. Backofen and Merrill L. Ebner Mass. Inst. of Tech. May 1963 53 p refs
(Contract DA-19-020-ORD-5235)
(WAL TR-310.24/5-4; AD-406167)

The plane-strain fracture toughness of quenched and tempered AISI 4340 steel was measured in tension at room temperature with circumferentially notched and fatigue-cracked specimens. Values of G_{IC} for indicating the variation encountered were 5.6, 23, and 254 in. lb/in.^{2} after tempering at 212°, 400°, and 800° F, respectively. Cracking characteristics were influenced by tempering temperature. Below about 700° F, little stable crack growth was found, and propagation occurred in a mixed mode that appeared to consist at least partly of cleavage fracture. At higher temperatures, initial cracking was stable and developed by a ductile shear process; rapid fracturing again occurred in a mixed mode. After tempering at 1000° F and above, fracture was ductile. Author

N64-10253 Bureau of Mines, Albany, Ore.
QUARTERLY METALLURGICAL PROGRESS REPORT FOR THE PERIOD OF JULY 1 THROUGH SEPTEMBER 30, 1963
A. H. Roberson et al [Sept. 30], 1963 25 p
(Contract AT(11-1)-599)
(USBM-U-1082) OTS: $0.50

Investigations are continuing in the following areas: (1) rare-earth alloy development, (2) hafnium carbide studies, (3) thorium alloy systems, (4) electron beam and cold mold induction melting, (5) uranium nitride melting and casting, (6) thermodynamics of cold mold arc melting, and (7) tungsten-rhenium tubing development. R.T.K.

N64-10330 Joint Publications Research Service, Washington, D.C.
PROSPECTS FOR THE PRODUCTION OF VANADIUM AND ITS ALLOYS FROM THE ORES OF KAZAKHSTAN
A. M. Kunayev and V. V. Voleynik Nov. 21, 1963 14 p refs
Transl. into ENGLISH of an article from Tr. Inst. Met. i. Obegash-Cheniye Akad. Nauk KaSSR (Alma-Ata), v. 5, 1962 p 3–11
(JPRS-21973; OTS-63-41188) OTS: $0.50

The possibilities of obtaining vanadium compounds, vanadium alloys, and ductile vanadium from Kazakhstan ores were investigated and the following processes were considered: (1) existing technological systems for processing vanadium raw material and methods for obtaining vanadium slags from iron ores, depending on the vanadium content, (2) methods for obtaining vanadium alloys—the use and advantages of the electrolytic method, and (3) methods of obtaining pure vanadium—calcium thermal process, vacuum carbon thermal method, carbon thermal method, chloride method, iodine method, and alumothermic reduction. R.T.K.

N64-10334* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
EFFECT OF TWO BRAZE COATINGS, PROCESSING VARIABLES, AND HEAT TREATMENTS ON 1200°F STRESS-RUPTURE STRENGTH OF L-605, A-286, AND INCONEL 700 SHEET
John H. Sinclair and Charles A. Gyorgak Washington, NASA, Nov. 1963 55 p refs
(NASA TN D-1880) OTS: $1.50

The nickel-base braze alloys and brazing processes investigated affect the stress-rupture life of L-605, A-286, and Inconel 700 sheet materials. The thermal treatment required to braze improves the life of L-605 but is detrimental to A-286 and Inconel 700. Boron bearing braze (NiCrSiB) improves the stress-rupture life of L-605 and Inconel 700, but decreases the stress-rupture life of A-286. L-605 coated with boron-free braze (NiCrSi) has better stress-rupture properties than L-605 in the as-received condition, because the temperature cycle required for brazing improves the stress-rupture properties of L-605. NiCrSi improves the life of Inconel 700 and is less detrimental to A-286 than NiCrSiB. Author

N64-10339* Jet Propulsion Lab. Calif. Inst. of Tech., Pasadena
MECHANICAL AND THERMAL PROPERTIES OF HOT-PRESSED ZIRCONIUM CARBIDE TESTED TO 2600°C
Martin H. Leipold and Thomas H. Nielsen Sept. 15, 1963 19 p refs
(NASA Contract NAS7-100)
(NASA CR-52455; JPL-TR-32-452) OTS: $1.60 ph, $0.80 mf

Tensile properties, creep, thermal expansion, and modulus of elasticity data were determined for hot-pressed zirconium carbide. The material was relatively impure, containing 1% to 2% nitrogen and 1% to 2% free carbon. Tensile and creep properties, which were measured to 2600° C, indicated that above 2100° C the strength is 2,000 psi or lower and the elongation is 40% or greater, thus signifying little structural usefulness. It is proposed that results were influenced by the presence of impurity at the grain boundaries. Mean coefficient of thermal expansion of this zirconium carbide varied from 5.6×10^{-6} C^{-1} (for 25° to 400° C) to 7.6×10^{-6} C^{-1} (for 25° to 2300° C). Room-temperature modulus-of-elasticity values averaging 51.6×10^6 psi were obtained by dynamic methods. Author

N64-10341* Lockheed Nuclear Products, Marietta, Ga.
EFFECT OF NUCLEAR RADIATION ON MATERIALS AT CRYOGENIC TEMPERATURES. PEDIGREES OF METALS AND ALLOYS
C. A. Schwanbeck Sept. 1963 41 p
(NASA Contract NASw-114)
(NASA CR-52533; ER-5542, Addendum) OTS: $4.60 ph, $1.43 mf

Chemical analyses, mechanical properties data, and microstructure photographs are presented for the following alloys: aluminum 7079 and A356; Inconel X (nickel alloy); stainless steel A-286, AM 350, 440-C, and 17-7PH; austenitic manganese steel T450; and titanium alloy 5 Al-2.5Sn Eli. R.T.K.

N64-10370* Lockheed Nuclear Products, Marietta, Ga.
EFFECT OF NUCLEAR RADIATION ON MATERIALS AT CRYOGENIC TEMPERATURES Quarterly Progress Report No. 9, Jan.-Mar. 1963
C. A. Schwanbeck 1963 79 p
(NASA Contract NASw-114)
(NASA CR-52498; ER-6219) OTS: $7.60 ph, $2.57 mf

Preparation for in-pile testing continued with modification of the test loops and the test loop transfer-system carriages. Procedures were written outlining the method of operating test equipment which will be used in the test program. Remote tool fabrication continued. Chemical analyses of the reactor primary water indicated the presence of tungsten contamination, and an investigation was undertaken to determine the source. Author

N64-10372* Syracuse U. Research Inst., N.Y.
ADHESION BETWEEN ATOMICALLY CLEAN METALLIC SURFACES Final Report
Douglas V. Keller, Jr. July 1962 35 p
(NASA Grant NsG-159-61)
(NASA CR-52482; SURI-MET-E-905-1-7-62F)

Results are presented of studies of (1) bulk adhesion; (2) determination of the surface energy of silver at −187° C; and (3) determination of the crystal structure of the interface formed in adhesion. In the bulk-adhesion study, the energy of adhesion was found to be a function of the loss of the free surface energy of both free surfaces which in turn is a function of their crystallographic orientation, of the neighbor orientation across the interface, and of the nature and energy of the atomic bond between the two different metals constituting the contacting surface. The couples Fe/Al, Cu/Ag, Ni/Cu, and Ni/Mo all form a sort of intermediate phase with adhesion observed, while the couples Cu/Mo, Ag/Mo, Ag/Fe, Ag/Ni all form immiscible mixtures with no adhesion observed. In the surface energy study, a low temperature, high-vacuum, calorimetric apparatus is being assembled. In the interface study, the deposition of a very thin film of nickel on an atomically clean substrate of aluminum at various temperatures was accomplished, and the metallurgical phases present will be determined by electron diffraction techniques. M.P.G.

N64-10378 Atomic Energy of Canada Ltd., Chalk River, Ontario
THE EFFECT OF HYDROGEN ON THE CREEP PROPERTIES OF ZIRCALOY-2
L. G. Bell Aug. 1963 25 p refs
(AECL-1826; CRGM-1169) Available from Scientific Document Distribution Office, Atomic Energy of Canada Ltd., Chalk River, Ontario: $0.50

Creep tests at 20,000 lb/in^2 and 300° F on annealed Zircaloy-2 showed that hydrogen oncentrations up to 1075 ppm did not deteriorate the creep strength. Increasing the hydrogen content, in fact, decreased the amount of deformation obtained. Thermal cycles during the creep tests resulted in strain steps for those specimens with between 14 and 270 ppm hydrogen. Stress rupture tests at 300° C on notched specimens of annealed Zircaloy-2 containing 200 and 500 ppm hydrogen showed no tendency for delayed failure hydrogen embrittlement. Author

N64-10382 Joint Publications Research Service, Washington, D.C.
INFLUENCE OF THE RARE-EARTH ELEMENTS ON THE PROPERTIES OF HIGH-TEMPERATURE NICKEL-BASE ALLOYS
T. V. Svistunova and G. V. Estulin Nov. 18, 1963 12 p refs
Transl. into ENGLISH from Stal. (Moscow), no. 9, Sept. 1963 p 835–838
(JPRS-21895; OTS-63-41151) OTS: $0.50

Introductions of additions of cerium, lanthanum, and neodymium into the alloy EI-437 substantially increase the long-term strength and plasticity of the metal at high temperatures. In order to determine the optimum value of the addition of rare-earth elements in the smelting of highly alloyed steels and alloys, the deoxidizing and desulfurizing role of the rare-earth elements as well as the influence of their residual content on the structure and properties after deformation of the alloy EI-437 was investigated. The strongest influence was found to be exerted by additions of neodymium. R.T.K.

N64-10396 California U., Berkeley. Lawrence Radiation Lab.
SUBSTRUCTURES IN PLASTICALLY DEFORMED COPPER
Om Johari (M.S. Thesis) Sept. 1963 69 p refs
(Contract W-7405-eng-48)
(UCRL-10932) OTS: $1.50

Transmission electron microscopy techniques were used to study the substructures in single and polycrystals of pure copper deformed under different conditions of static and shock loading. Static loading involved 20% tensile deformation of single and polycrystals at the temperatures 77° K, 196° K, and 273° K and strain rates of 1 and 10^{-3} per minute. The shock loading was carried out on thin polycrystalline sheets. The pressures ranged from 16 to 200 kbars. In tensile deformed specimens no systematic correlation between observed substructure and deformation conditions was found. The substructures varied widely in the same specimen from one region to another. It does not seem possible to correlate changes in cell size to various deformation conditions for two reasons: first, the cells are not always observed, and secondly, there is a wide change in cell size in the areas which show cells. From single-crystal observations it was found that at least two slip systems should operate for formation of cells and that the dislocation density is much higher in polycrystals than in single crystals. In shock-loaded specimens the cells were uniform and after a cell size of the order of 0.15μ, the substructure consisted of microtwinned regions and areas of heavy dislocation density. It was shown that the present theories are not sufficient to specify the exact quantitative conditions for the onset of twinning. It is proposed that this type of analysis should be applied to alloys of different stacking fault energies in order to better understand the twinning phenomenon. Author

N64-10416 Iowa State University of Science and Technology, Ames Ames Lab.
HIGH PURITY METALS AVAILABLE FROM AMERICAN PRODUCERS

H. A. Wilhelm and R. E. Mc Carley, comp. Aug. 1963 61 p (Contract W-7405-eng-82)
(ISC-1029, Rev.) OTS: $1.00

A list of high-purity metals available from American producers is presented in tabular form. Data presented for each metal include: element, atomic number, and toxicity; purity in weight percent; impurities in ppm; method of preparation; forms and sizes available; approximate price; and producer. M.P.G.

N64-10545 Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson AFB, Ohio
MECHANICAL PROPERTIES OF AM-350, POTOMAC A, POTOMAC M, AND VASCO JET-1000 STEEL ALLOYS IN THE ANNEALED CONDITION [Final Report, June 1959-June 1960]
Robert G. Henning and Alton W. Brisbane May 1963 112 p
(ASD-TDR-63-116; AD-408776)

Mechanical properties of three hot-worked steels and one precipitation-hardening stainless steel were obtained. Properties obtained were tensile, compression, sheet single shear, bearing, and 105-degree-angle bend tests. Tests were conducted at temperatures of 80°, 400°, 600°, 800°, 1000°, and 1200° F. Stressed and nonstressed exposure tests were conducted only at 600°, 800°, and 1000° F. All properties were obtained from the longitudinal direction of the material except three tensile specimens from each material in the transverse direction, which were tested only at 80° F. Data obtained are presented graphically. Metallurgical histories and chemical analyses are also included. Author

N64-10546 Purdue U., Lafayette, Ind.
PREDICTION OF THERMAL CONDUCTIVITY OF METALLIC ELEMENTS AND THEIR DILUTE ALLOYS AT CRYOGENIC TEMPERATURES [Report, Sept. 1960-Jan. 1963]
Ared Cezairliyan (Ph.D. Thesis) Wright-Patterson AFB, Ohio, AF Mater. Lab., Sept. 1963 150 p refs
(Contract AF 33(616)-7617)
(ASD-TDR-63-291; AD 422069)

A brief outline of the present theory of thermal conductivity of metals is given with particular emphasis to cryogenic temperatures. The principle of corresponding states is applied to thermal conductivity of metallic elements and their dilute alloys at low temperatures (where $0<T<\theta/10$ is the Debye temperature). Based on the theory of metals and the principle of corresponding states, a universal relation for the reduced thermal conductivity is obtained. Discrepancies between the theoretical and experimental results are investigated, and the thermal conductivity relation is modified to remove these discrepancies. The interaction (coupling) between ideal and impurity thermal resistances is also treated. Author

N64-10554 New York U., N.Y. Coll. of Engineering
DEVELOPMENT OF TOUGH, HIGH-STRENGTH ALPHA-BETA TITANIUM-BASE ALLOYS AT 240,000-260,000 PSI YIELD STRENGTH LEVEL Quarterly Progress Report No. 3, Dec. 26, 1962-Mar. 25, 1963
R. A. Farrar and H. Margolin [1963] 46 p refs
(Contract DA-30-069-ORD-3690)
(WAL-TR-401/303-2; AD-417472)

In order to develop titanium alloys with 0.1% yield strength in the range 240,000 to 260,000 psi, a series of 15 eight-pound alloys are being prepared at two interstitial levels. Beta transus temperatures have been determined for each of 30 alloys on 25-gram ingots. Melting and forging of eight-pound ingots have been completed; and machining, heat treating, and testing of tensile and impact specimens are in progress. Heat treatment and testing of specimens were completed for seventeen alloys and the data are included in this report. Author

N64-10562 Joint Publications Research Service, Washington, D.C.
RHENIUM IN SOVIET POWDER METALLURGY
Feb. 8, 1963 67 p refs Transl. into ENGLISH of selected articles in the book "Reniy Trudy Vsesoyuzn. Soveshch. po Probleme Reniya, 26-27 Maya 1958" Moscow, Acad. of Sci. State Publ. House, 1961
(JPRS-17539; OTS-63-21085) OTS: $1.75

Methods of obtaining high purity rhenium are discussed, including a process of vacuum heating for two hours and the extraction of the metal from ammonium perrhenate to lower the content of potassium and calcium. A method is proposed for obtaining rhenium with a purity of 99.98%. The possibility of obtaining pure rhenium coatings for materials by an electrolytic method is discussed. The physicochemical properties and fields of application of rhenium metal and its tungsten alloys are then discussed. Such materials are found useful as: 1) alloying agents to raise the heat resistance of alloys; 2) agents in the electric vacuum industry; 3) thermocouples; 4) materials for electric contacts; 5) emitters; 6) wear-resistant materials; 7) material for high temperature coils; 8) additive increasing the plasticity of tungsten and molybdenum; 9) burning intensifier in engines; and 10) galvanic coatings and catalysts. D.E.R.

N64-10565 Joint Publications Research Service, Washington, D.C.
X-RAY STUDY OF THE SOLUBILITY OF IMPURITIES IN BERYLLIUM
V. M. Amonenko, V. Ye. Ivanov, G. F. Tikhinskiy, and V. A. Finkel' Feb. 18, 1963 11 p refs Transl. into ENGLISH of an article from Fiz. Metal. i Metalloved., Moscow, no. 6 1962 p 852-856
(JPRS-17681; OTS-63-21148) OTS: $0.50

The solubility of Ti, Zr, Y, and Ni in beryllium was investigated by means of X-ray structural analysis of hardened forms. It was found that only nickel has marked solubility in beryllium at room temperature. Through the difference between the values of the parameters of the beryllium crystalline lattice saturated with gases (obtained from photographs of high-temperature beryllium in air), and of high purity Be (obtained from photographs of distilled Be in vacuum), the limiting solubility of O and N was found to be 2 to 3 percent at 900° C. A solid solution of gases in beryllium is not obtained with hardening at room temperature. It is noted that Ni lowers the solubility of oxygen and nitrogen in beryllium at high temperatures. Author

N64-10567 Joint Publications Research Service, Washington, D.C.
OXIDATION OF TITANIUM AT LOW TEMPERATURES
L. V. Biryukova and L. L. Neroslavskaya Feb. 26, 1963 9 p refs Transl. into ENGLISH of an article from Zh. Prikl. Khim. (Moscow), v. 35, no. 7, July 1962 p 1629-1633
(JPRS-17815; OTS-63-21203) OTS: $0.50

The oxidizability of titanium in water and in air at low temperatures (from 20° to 100° C and from 80° to 120° C, respectively) was investigated, and the extent of oxygen contamination of titanium in air and in water at 100° C was determined. The first experiment was based on the formation of films on the metal surface. The extent of oxygen contamination was determined by vacuum extraction. Results are: (1) Titanium in air and in water oxidizes at low temperatures. The extent of this

oxidation depends on the cleanness of the surface, the duration of contact of the metal with the surrounding environment, and on the temperature. (2) The amount of oxygen absorbed by titanium at low temperatures is not high. At 100° C, for a period of 6 hours in air and in water, the oxygen content in the sponge titanium, with a clean surface of 1 m^2 increases by about 0.1%. I.v.L.

N64-10574 Joint Publications Research Service, Washington, D.C.

ISOTHERMAL SINTERING OF METALLIC POWDERS UNDER PRESSURE

M. Yu. Bal'shin and A. A. Trofimova Mar. 20, 1963 17 p refs Transl. into ENGLISH of an article from Izv. Akad. Nauk SSSR, Otol. Tekn. Nauk, Met. i Toplivo, Moscow, no. 6, Nov.–Dec. 1961, p 45–51

(JPRS-18245; OTS-63-21371) OTS: $0.50

This report deals with the sintering under pressure of powdered copper, nickel, and iron of varying grain size. The sintering was done in a special dilatometer with graphite press-forms, at different temperatures and under pressures from two to 64 kg/cm^2. Pressure was applied on reaching a required level of temperature, heating rate being about 12 deg/min. Duration of isothermal treatment was 256 minutes, with recordings of change in sample size being made at intervals of 1, 2, 4, 8, 16, 32, 64, 128, and 256 minutes. Sintering and cooling took pace in a hydrogen atmosphere. Author

N64-10579 Joint Publications Research Service, Washington, D.C.

REDUCTION TEMPERATURE OF METALS AND HEAT RESISTANCE OF ALLOYS

V. P. Yelyutin, R. F. Merkulova, Yu. A. Pavlov, Ye. I. Mozzhukhim, and V. I. Shulepov Apr. 16, 1963 23 p refs Transl. into ENGLISH of two articles from Mosk. Inst. Stali, Sb. (Moscow), v. 38, 1958 p 79–87, 427-432)

(JPRS-18731; OTS-63-21589) OTS: $0.75

The first paper describes a method which was developed for determining the temperature of initiation for the carbon reduction of metal oxides by use of a radioactive isotope of carbon. The temperatures determined by this method are given. The most precise relationship was found between the beginning of the carbon reduction of the oxides and their melting points; this relationship was expressed by a linear equation. In the second paper the effect of chemical heat treatment on the heat resistance of alloys was studied and the following conclusions were reported: (1) chemical heat treatment of the TiC-NiAl alloys by beryllium increases their scaling resistance almost 20-fold, (2) chemical heat treatment of the TiC-NiAl alloys by chromium increases their scaling resistance 3-fold, and (3) chemical heat treatment of these alloys by niobium and zirconium does not improve their scaling resistance. R.T.K.

N64-10580 Joint Publications Research Service, Washington, D.C.

PHASE ANALYSIS OF NONFERROUS ALLOYS

M. N. Kozlova, N. F. Lashko, and K. P. Sorokina Apr. 23, 1963 24 p refs Transl. into ENGLISH of an article from Zavodsk. Lab., Moscow, v. 29, no. 3, 1963 p 261–271

(JPRS-18853; OTS-63-21650) OTS: $0.75

Several problems concerning the isolation of phases in nonferrous alloys are reviewed. The distinction of electrochemical processes in (anodic) phase separation consists in the fact that an external current passing through the closed circuit (anode-cathode-electrolyte) is superimposed on microcurrents of galvanic pairs arising between the anodic and cathodic sections of the specimen (anode). Thus the process of phase separation proceeds under conditions of a specially formed polarization. Polarization processes, particularly anodic, can essentially alter the potentials of the separated phases as a function of their relative polarizability. This indicates that polarization is the controlling process in phase separation in heterogeneous alloys. The following alloys in particular are discussed: nickel, cobalt, chromium, copper, titanium, niobium, zinc, aluminum, and magnesium. P.V.E.

N64-10586 Joint Publications Research Service, Washington, D.C.

RADIOACTIVE ISOTOPE STUDY OF CRYSTALLIZATION OF ALUMINUM DURING CONTINUOUS CASTING

V. I. Dobatkin and B. I. Simakovskiy May 23, 1963 14 p refs Transl. into ENGLISH of an article from Litevnoye Proizvodstvo (Moscow), no. 10, 1960 p 34–36

(JPRS 19372; OTS-63-21902) OTS: $0.50

The phenomena occurring in aluminum melts prior to the time of crystallization have been studied using radioisotopic tracers. The work is an attempt to uncover the nature of the motions of the melt during continuous casting of aluminum and duraluminum ingots. Castings of Al, 100 and 180 mm tall, were made 280 mm in diameter at a rate of 2.5 to 6 meters/hrs. A molten Al alloy containing 1% Ca^{45} was injected into the crater and casting was stopped. The melt in the crater was mixed, and radiographic observations were made on the castings with 20–25 day exposures. The data indicate that this method ascertains the shape of the crater and the nature of its peculiarities. The radiographs indicate the character of the melt, its structural inhomogeneity, the grain structure, and the mechanism of hot crack formation. D.E.R.

N64-10590 Joint Publications Research Service, Washington, D.C.

THE SECOND ALL-UNION CONFERENCE ON RHENIUM

A. Tylkina and K. B. Povarova June 20, 1963 6 p Transl. into ENGLISH of an article from Izv. Acad. Nauk SSSR, Otd. Tekhn. Nauk, Met. i Gornoye delo, no. 2, Mar.–Apr. 1963 p 174–176

(JPRS-19761; OTS 63-22079) OTS: $0.50

Conference objectives were: (1) recommendations to introduce effective methods for the extraction of rhenium from ore; (2) the formulation of perspective directives for the industrial application of rhenium and its alloys; and (3) the determination of immediate steps to be taken for theoretical and experimental research on rhenium. J.E.T.

N64-10612* Advanced Metals Research Corp., Somerville, Mass.

PROPERTIES OF NON-STOICHIOMETRIC METALLIC CARBIDES Quarterly Progress Report No. 2

Robert K. Lewis and John T. Norton Sept. 12, 1963 18 p refs (NASA Contract NASw-663)

(NASA CR-52420) OTS: $1.60 ph, $0.80 mf

Progress reported in the program designed to study the physical and mechanical properties of nonstoichiometric metal carbides includes the preparation of titanium carbide powders of nonstoichiometric composition suitable for property measurements, measurements of the density of powders of TiC over the entire composition range, the examination of a single crystal of titanium carbide, and resistivity and Hall coefficient measurements on TiC single crystals. Work continues on the thermal expansion measurements of such powders, their thermoelectric power measurements, and their magnetic susceptibility measurements. D.E.R.

N64-10635 Joint Publications Research Service, Washington, D.C.

A HIGH-TEMPERATURE MATERIAL MADE OF SINTERED ALUMINUM POWDER (SAP), USSR

I. N. Fridlyander and B. I. Matveyev, eds. Feb. 26, 1963 145 p refs Transl. into ENGLISH of the book "Teploprochnyy Material iz Spechennoy Alyuminiyevoy Pudry (SAP)" Moscow, Oborongiz, 1961

(JPRS-17818; OTS-63-21205) OTS: $2.75

These articles present the results of work on the preparation of intermediates made of sintered aluminum powder, and the study of their structure and properties. Methods are presented for obtaining aluminum powder and briquettes. The dependence of the properties of the intermediates on the content of aluminum oxide in the powder, on the degree of cold and hot deformation, pressing forces, and other factors is demonstrated. The technology of pressing sheets from sintered aluminum powder, and the results of an X-ray investigation of the structure of the oxide phase in this material are described. Author

N64-10642 Joint Publications Research Service, Washington, D.C.

SOVIET RESEARCH IN HARD ALLOYS

Apr. 10, 1963 44 p refs Transl. into ENGLISH of a book "Spravochnik po machinostroital'nym i ihk splyy" Moscow, 1959 p 533-551; 559-561; and 565 and 570

(JPRS-18637; OTS-63-21554) OTS: $1.25

Alloys based on refractory hard carbides (called powder-metallurgical hard alloys), chiefly tungsten, titanium, and tantalum carbides with additions of cobalt as a binder are discussed. The following points of interest in the use and study of refractory hard alloys are discussed: (1) structure and properties of tungsten carbide-cobalt alloys, (2) structure and properties of tungsten carbide-titanium carbide-cobalt alloys, (3) structure and properties of tungsten carbide-titanium carbide-tantalum (niobium) carbide-cobalt alloys, (4) corrosion resistance of powder-metallurgical hard alloys, (5) industrial powder-metallurgical tool hard alloys produced in the U.S.S.R., and (6) tool material based on aluminum oxide. P.V.E.

N64-10645 Joint Publications Research Service, Washington, D.C.

ACTIVATION ANALYSIS OF RARE-EARTH ELEMENTS

Yang Yu-sheng Apr. 23, 1963 8 p refs Transl. into ENGLISH of an article from Hua Hsueh Tung Pao (Peiping), no. 5, 1961 p 7-9

(JPRS-18861; OTS-63-21655) OTS: $0.50

The various methods used in the activation analysis of rare-earth elements are presented. The articles which have been published in this area are summarized in an effort to present a brief description of the past work conducted and the future developmental trend. The articles are classified according to content and subject matter as follows: (1) samples used in analysis, (2) numbers of elements determined, (3) determination methods used. The following methods and their underlying principles in activation analysis of rare-earth elements have been found to be applicable to other elements: (1) β-ray decay curve method, (2) δ-ray spectrometer method, and (3) determination after the elements have been separated through the ion-exchange method. R.T.K.

N64-10656 Joint Publications Research Service, Washington, D.C.

VERTICAL SINTERING FURNACE

A. N. Nikolayev May 27, 1963 17 p refs Transl. into ENGLISH of an article from Poroshkovaya Met. (Kiev), no. 5 (II), 1962 p 89-98

(JPRS-19429; OTS 63-21927) OTS: $0.50

Vertical furnace sintering has been studied using four experimental furnaces with duct diameters of 10, 18, 30, and 120 mm which consume 1.5, 2.8, 2.5, and 6.0 kw, respectively. Bushings of various diameters and porous powder strip were sintered in these furnaces. In addition, some preliminary designs were made of continuous-operation industrial vertical furnaces, and thermal and economic calculations were carried out. The possibility of the application of such furnaces in production lines was studied, and it is recommended on the basis of the following results: (1) they have a high production rate and are easily installed; (2) the area required for installation and the power consumption per sintered part is also 70% to 80% less than for a horizontal furnace; (3) the quality of the sintering is higher than that in horizontal furnaces; and (4) uniform and thorough heating was obtained permitting an increase in the rate of heating, and the cooling rate could be increased without introducing complexity into the design. R.T.K.

19 MATERIALS, NONMETALLIC

Includes mechanical and physical properties of nonmetals (e.g., plastics). *For related information see*: 07 Chemistry; 17 Machine Elements and Processes; 18 Materials, Metallic; 33 Stresses and Loads; and 34 Structural Design.

N64-10034 European Atomic Energy Community, Brussels (Belgium)

CLADDING BETWEEN ALPAX AND SINTERED AL-Al_2O_3, APPLICATION TO BRAZING OF PIECES OF SINTERED AL-Al_2O_3 [EXAMEN DE PLACAGES ALPAX/FRITTE AL-Al_2O_3 APPLICATION AU BRASAGE DE PIECES EN FRITTE AL-Al_2O_3]

J. Herenquel and C. Leymonie (TREFIMETAUX) July 1963 26 p ref In FRENCH; ENGLISH summary Presented at the Journées Mét. d'Automne, Paris, 15-19 Oct. 1962

(Contract EURATOM/T.L.H.-004-60-9 ORG F)

(EUR 274.f) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 40 Belg. Fr.

Co-rolling was used to carry out studies on alpax-sintered Al-Al_2O_3 joints. Acceptable bonds were obtained as a result of co-rolling at 350° and 450° C. However, after annealing at high temperatures (450°, 500° and 560° C) designed to simulate the temperature conditions to which the cladding is likely to be subjected in practice, a noticeable stripping of the silicon particles in the alpax was observed in the diffusion zone. This stripping is a nuisance from the technical point of view (source of brittleness, risk of loss of leaktightness). The same experiments were carried out again, the normal alpax being replaced by a grade to which 0.02% of sodium has been added. Under these conditions the diffusion was no longer disturbed by the presence of coarse particles of silicon, and the diffusion zone is free of incipient internal fractures. Tests have been carried out on sheets of sintered Al-Al_2O_3 and on units consisting of a bar and a tube. The bond obtained is, in all cases, of good quality, unimpaired by diffusion. The brazings obtained have a high mechanical resistance, which under certain conditions is superior to that of the sintered materials themselves. Furthermore, they are entirely unaffected by helium. Author

N64-10070 Joint Publications Research Service, Washington, D.C.
A STUDY OF THE CONDUCTIVITY OF ROCKS AT HIGH TEMPERATURES
U. I. Moiseyenko and V. Ye Istomin Oct. 29, 1963 8 p refs Transl. into ENGLISH from Geol. i Geofiz., Akad. Nauk SSSR, Sibirsk. Otd. (Novosibirsk), no. 8, Aug. 1963 p 106–109
(JPRS-21649; OTS-63-41032) OTS: $0.50

The influence of temperature on the electrical resistivity of dunite (Eastern Sayan), olivinite (Monchegorsk), pyroxenite (the Urals), and granite (Kazakhstan) was investigated. The temperature range was from 20° to 1200° C. A study of the curves showing resistivity as a function of temperature for these four rocks justifies a belief in a regular pattern underlying loss of resistivity with continued heating up to 1200° C. The curves for the different rocks coalesce towards the bottom of the graph, since the values for resistivity in that area were very similar. On the whole, the resistivity in these four rocks, upon heating to 1200° C, is lowered by a factor of 10^6 to 10^8 ohm-meters. The relationship between resistivity and temperature, as demonstrated by this experiment, can prove useful in the interpretation of geophysical data collected on the structure of abyssal rocks of the earth's crust. I.v.L.

N64-10074* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
TRANSPORT PHENOMENA IN PURE AND DOPED MAGNESIUM OXIDE
Myron O. Davies Repr. from J. Chem. Phys., v. 38, no. 9, May 1, 1963 p 2047–2055
(NASA RP-46)

Some ac electrical conductivity measurements have been made on polycrystalline samples of various compositions in the MgO-NiO system. Four activation energies have been obtained with pure MgO: 5.2, 2.7, 3.5, and 0.92 ev. These seem to be the activation energies, respectively, for intrinsic O^- conductivity, extrinsic O^- conductivity, intrinsic Mg^{++} conductivity, and extrinsic Mg^{++} conductivity. Introduction of NiO into the specimens increases the conductivity and decreases the activation energy. The conductivity of the polycrystalline MgO specimens used in this study is larger than literature data for MgO single crystals. This difference results from the large number of grain boundaries present in polycrystals. Author

N64-10089* IIT Research Inst., Chicago, Ill.
INVESTIGATION OF LIGHT SCATTERING IN HIGHLY REFLECTING PIGMENTED COATINGS Quarterly Report, July 1, 1963-Oct. 1, 1963
G. A. Zerlaut, S. Katz, and J. Stockham Oct. 11, 1963 30 p refs
(NASA Contract NASr-65(07))
(NASA CR-52187; IITRI-C6018-3) OTS: $2.60 ph, $1.10 mf

Investigations were conducted to prepare carefully designed arrays of silver halide crystals as models for elucidation of the light-scattering behavior of closely packed systems. The problems associated with the preparation of the silver halide arrays are described. Also discussed are the techniques used to measure the particle size and the optical properties of the crystals. Author

N64-10128 Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
EVALUATION OF FUSED UO_2
G. Rolland Cole and J. T. Bailey Apr. 1963 41 p refs
(Contract AT(07-2)-1)
(DP-819) OTS: $1.00

The density and purity of UO_2 from several suppliers was evaluated. Densities of large pieces varied widely, but variations in pycnometer and bulk densities of crushed UO_2 powder were small. Average oxygen-to-uranium ratios ranged from 1.94 to 2.14. Impurities visible as microscopic inclusions were U_4O_9, metallic uranium, UC, and UN_2. The chief trace metallic contaminants were aluminum, iron, and silicon. Hydrogen, nitrogen, carbon monoxide, and carbon dioxide were evolved during vacuum extraction. Author

N64-10130 Argonne National Lab., Ill.
Mn^{56} COINCIDENCE COUNTING FACILITY
A. De Volpi, K. G. A. Porges, and R. N. Larsen Aug. 1963 115 p refs
(Contract W-31-109-eng-38)
(ANL-6760)

A two-stage absolute counting facility for large liquid samples of aqueous $Mn^{56}SO_4$, primarily intended for better than 1% precision measurements of neutron source strengths by the "manganese bath" technique, is described here. Two-liter samples are counted in a $\gamma\gamma$ coincidence arrangement which greatly improves long-term reproducibility at some sacrifice in counting statistics; this sacrifice is, however, lessened through a novel pulse-distribution scheme which allows full utilization of the output of each detector channel. The system is calibrated on an absolute scale through another unit which counts aliquots of strongly activated samples mixed with liquid scintillator in a $4\pi\beta/\gamma$ coincidence mode. The entire facility is designed to be readily adaptable to other radioisotope-counting requirements. Author

N64-10156 Iowa State U. of Science and Tech., Ames
METAL NITRATES COMPLEXES WITH TRIBUTYL PHOSPHATE AND WITH TRIOCTYL PHOSPHINE OXIDE
Eugene Warren Nadig and Morton Smutz Feb. 1963 115 p refs
(Contract W-7405-eng-82)
(IS-595) OTS: $2.25

Results from an infrared spectral investigation of organic solvents containing various inorganic solutes included the following: (1) in all solute-solvent systems studied, a single complex was formed with the attachment of the solute taking place at the phosphoryl oxygen in the case of tributyl phosphate and tri-n-octyl phosphine oxide; (2) empirical studies indicated that most nitrates were of the C_{2v} symmetry type with the nitrato group covalently bound through one oxygen atom to the metal; (3) a linear correlation was obtained between the ionic potential (charge of cation/ionic radius of cation) of a solute in tributyl phosphate and P → O frequency shift; (4) a linear relation between P → O frequency shift and the covalency of the solute, measured by the frequency difference $\nu_4-\nu_1$, was found for tributyl phosphate; and (5) the maximum distribution coefficient of a nitrate between tributyl phosphate and the aqueous phase was found to be related to both the ionic potential of the cation and grams of extractable species per 100 grams of complex. P.V.E

N64-10194 Rochester U., N.Y.
MATRIX ELEMENTS OF THE OCTET OPERATOR OF SU_3
D. Lurié and A. J. Mac Farlane Oct. 8, 1963 49 p refs Submitted for Publication
(Contract AT(30-1)-875)
(URPA-13)

All the nonvanishing matrix elements of all the components of the tensor operator which belongs to the regular representation, the octet, of SU_3 have been evaluated. Of special interest is the component Y, for it is usual in the broken unitary

symmetry theory of strong interactions to assume that the interactions which break exact SU_3 invariance have the same transformation properties as *Y*. Knowledge of all the matrix elements of *Y* is essential if one is to do more than evaluate one-particle matrix elements in the broken unitary symmetry theory. This method provides such knowledge for all components of the octet tensor operator with little more effort than is needed to treat *Y* alone. Author

N64-10217 Argonne National Lab., Ill.
LABORATORY INVESTIGATIONS IN SUPPORT OF FLUID-BED FLUORIDE VOLATILITY PROCESSES. PART I. THE FLUORINATION OF URANIUM DIOXIDE-PLUTONIUM DIOXIDE SOLID SOLUTIONS
R. L. Jarry, L. J. Anastasia, J. Fischer, L. E. Trevorrow, T. D. Baker et al Sept. 1963 23 p refs
(Contract W-31-109-eng-38)
(ANL-6742)

The experimental work presented in this report has been directed toward devising a fluorination procedure which would be applicable to fluid-bed volatility processes and which would result in the optimum removal of uranium and plutonium as their hexafluorides. Synthetic mixtures were used to simulate the composition of the material that will be charged to the fluid-bed reactor in plant operations. Experiments were performed to select a suitable inert solid, to determine the optimum temperature, time, and fluorine concentration for the reaction, to study the effect of fission product elements on the retention of plutonium on the inert solid, and to investigate the effect of prior oxidation on the reactivity of the uranium dioxide-plutonium dioxide mixture. I.v.L.

N64-10218 Argonne National Lab., Ill.
LABORATORY INVESTIGATIONS IN SUPPORT OF FLUID BED FLUORIDE VOLATILITY PROCESSES. PART II. THE PROPERTIES OF PLUTONIUM HEXAFLUORIDE
Martin J. Steindler Aug. 1963 85 p refs
(Contract W-31-109-eng-38)
(ANL-6753)

Included are the preparation of plutonium hexafluoride, physical properties, absorption spectra, chemical reactions, decomposition of plutonium hexafluoride by radiation and heat, the corrosion of materials of construction by plutonium hexafluoride, and a summary of the biological and radiological hazards from plutonium hexafluoride. An expanded vapor pressure table is included. Author

N64-10219 Argonne National Lab., Ill.
LABORATORY INVESTIGATIONS IN SUPPORT OF FLUID BED FLUORIDE VOLATILITY PROCESSES. PART III. SEPARATION OF GASEOUS MIXTURES OF URANIUM HEXAFLUORIDE AND PLUTONIUM HEXAFLUORIDE BY THERMAL DECOMPOSITION
L. Trevorrow, J. Fischer, and J. Riha Aug. 1963 17 p refs
(Contract W-31-109-eng-38)
(ANL-6762)

Gaseous mixtures of uranium hexafluoride, plutonium hexafluoride, and helium were circulated for varying lengths of time through nickel vessels packed with nickel wool at temperatures of 150°, 200°, and 300° C. The initial ratios of uranium hexafluoride to plutonium hexafluoride in the mixtures were of the order of 10 to 1. The gas phase was analyzed for uranium and plutonium before and after circulation. The amounts of uranium and plutonium in the solid compounds deposited in the vessels were also determined. Passage of the mixtures through the hot vessels resulted in the removal of 99.5 to 99.9 percent of the plutonium. The solid product remaining in the vessels was plutonium tetrafluoride containing 0.09 to 1.3 percent uranium. Author

N64-10229 India. Dept. of Atomic Energy, Bombay
A QUANTITATIVE SPECTROCHEMICAL METHOD FOR THE ANALYSIS OF ZIRCONIA FOR LOW HAFNIA CONTENT
R. K. Dhumwad and B. R. Vengsarkar Atomic Energy Estab. Trombay, Anal. Div., 1963 10 p refs
(AEET/ANAL/27, Rev)

A method is described for the determination of hafnia in zirconia in the range of 0.0125% to 0.263%. The charges were excited in an intermittent ac arc (Hilger F.S. 110) of 6 amp at 230 v. The Hilger E.492 spectrograph giving a reciprocal dispersion of about 4 A/mm at 2600 A was used to photograph the spectra. The line pair chosen was Hf II 2641.406 A and Zr II 2642.514 A, the latter being the internal standard line. Standard deviations are 6%, 14% and 25% at 0.263%, 0.0225% and 0.0125% hafnia, respectively. Author

N64-10250 Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Materials Applications Div., AF Materials Lab.
AN INDEX TO NON METALLICS R&L PROGRAMS OF TEN AEROSPACE COMPANIES
May 9, 1963 215 p refs
(ASRCE-TM-62-24 Suppl. I; AD-404487)

This index covers 167 annotated abstracts describing nonmetallics Research and Development programs being conducted by ten aerospace companies. The index itself is made up of four sets of terms. The first set of terms is strictly on materials, the second on properties, the third on processes, and the fourth set consists of miscellaneous terms such as antennas, O-rings, and space vehicles. I.v.L.

N64-10254 Bureau of Mines, Salt Lake City, Utah
SELECTIVE ADSORPTION AND RECOVERY OF SULFUR DIOXIDE FROM INDUSTRIAL GASES BY USING SYNTHETIC ZEOLITES
D. A. Martin and F. E. Brantley 1963 19 p refs
(BM-RI-6321)

Synthetic zeolites were tried as selective adsorbents for recovering sulfur dioxide from synthetic gases and gases produced from gypsum decomposition. Initial adsorption tests, using the synthetic gases, indicated that three of these compounds, having sulfur dioxide capacities of up to 29 grams per 100 grams of adsorbent, were satisfactory. Regeneration studies showed that over 90% of the sulfur dioxide desorbed from the loaded beds was of sufficient purity for direct liquefaction. However, all zeolites tested lost adsorptive capacity with repeated use. The zeolite determined to be the most promising in the preliminary synthetic gas tests was also evaluated for capability in adsorbing sulfur dioxide from gases produced by the thermal decomposition of gypsum. Despite small amounts of hydrogen sulfide in the gypsum decomposition offgas, good adsorption of sulfur dioxide was attained. Author

N64-10308* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
A SUMMARY OF THE BEHAVIOR OF MATERIALS AT CRYOGENIC TEMPERATURES
Robert O. Hickel, Donald F. Johnson, and Richard H. Kemp Repr. from Metals Eng. Quart., May 1963 12 p refs Presented at Natl. Metal Congr., New York, Nov. 1, 1962

A summary is given of some of the pertinent results that have been obtained relative to the behavior of materials for temperatures ranging from 75° to −423° F. The results were obtained with uniaxial, sheet-type test specimens. The strength characteristics of a number of engineering materials that might be employed in the fabrication of cryogenic propellant tanks for space vehicles are briefly discussed. The results of burst testing biaxially stressed model pressure vessels at 75° and −423° F are presented, and preliminary attempts to correlate the biaxial burst strengths with uniaxial data through the use of Griffith-Irwin and Neuber concepts are discussed. Author

N64-10368* Electric Storage Battery Co., Yardley, Pa.
ALKALIME BATTERY SEPARATOR STUDY Fourth Quarterly Report, Mar. 28–June 28, 1963
C. Garvin Oberholzer, A. J. Salkind, and E. Weiss July 11, 1963 29 p refs

Progress is reported in oxidation testing, cellophane degradation and modification, diffusion rate of silver ions, measurement of average pore size of separator materials, and dimensional change measurements. J.E.T.

N64-10369* Electric Storage Battery Co., Yardley, Pa.
ALKALINE BATTERY SEPARATOR STUDY Fifth Quarterly Report, June 29-Sept. 28, 1963
C. Garvin Oberholzer, J. B. Ockerman, and E. Weiss Oct. 11, 1963 34 p refs
(NASA Contract NAS5-2860)
(NASA CR-52478; ESB-7054.57) OTS: $3.60 ph, $1.22 mf

Progress is reported in the program designed to evaluate the different alkaline battery separator materials. Cellulosic membranes, cellophane and sausage casings, are shown to be readily oxidized by the alkaline environment, but the addition of amine antioxidants has resulted in improving their oxidation stability without raising their electrical resistance. Treatment of the cellophane with isocyanates does not cause an increase in electrical resistivity, does improve the mechanical properties of the material, but does not enhance the oxidation resistance. Diffusion tests show that there is no diffusion of silver ions through cellulosic membranes but that the ions are retained by, and react with, the membrane. Ag ions are found to diffuse through plastic types of membranes. Cellulosic membranes, though consumed in the process, are effective barriers for the silver ions. D.E.R.

N64-10547 Air Force Systems Command, Wright-Patterson AFB, Ohio AF Mater. Lab.
INTERIM SUMMARY OF PHYSICAL PROPERTY DATA ON NEW GRAPHITES
Lawrence Kopell Sept. 1963 52 p refs
(ASD-TDR-63-719; AD-423234)

A summary and analysis of test data on graphite properties are presented. Data extracted from monthly progress reports form the basis of this report. Recent unreported data are also included. A description of various newly developed graphite materials is also provided. Author

N64-10587 Joint Publications Research Service, Washington, D.C.
GLASS FIBER REINFORCED PLASTICS
Boris Abramovich Kiselev May 24, 1963 342 p refs Transl. into ENGLISH of a book "Stekloplastiki" (Moscow), 2d Print., Oct. 18, 1963 p 1–240
(JPRS-19389; OTS-63-21906) OTS: $5.00

Glass-fiber-reinforced plastics are grouped into four basic groups of materials: (1) glass textolites; (2) fibrous glasses—cast and pressed compositions; (3) oriented glass-fiber-reinforced plastics; and (4) glass-fiber-reinforced plastics based on preformed glass fibers or mats. Each class is described and the various uses for each are enumerated. The binders used in the glass-plastic industry are described, the methods of manufacturing glass plastics are discussed, the properties of fiberglass and the experiments on such properties are discussed, and the primary areas of importance for the use of such materials are discussed. D.E.R.

N64-10626 Picatinny Arsenal, Dover, N.J. Plastics Tech. Evaluation Center
DIRECTORY IN PLASTICS-KNOWLEDGEABLE GOVERNMENT PERSONNEL
Norman E. Beach Apr. 1963 256 p refs Supersedes Plastec-5
(Plastec-5A; AD-419399) OTS: $3.50

This document provides a means for the rapid identification and contacting of those personnel within the Department of Defense who are knowledgeable in the various areas of plastics development, manufacture, and uses. This revision updates the original entries from the Defense activities concerned with plastics. It has been expanded within and beyond the Departments of the Army, Navy, and Air Force, to include the Departments of the Treasury (Coast Guard), Agriculture (Forest Products Laboratory), Commerce (National Bureau of Standards), and the Interior (Bureau of Mines). Included also are Government-funded information agencies, and the National Aeronautics and Space Administration. Author

N64-10641 Joint Publications Research Service, Washington, D.C.
FIBERGLASS BUILDING MATERIALS, USSR
T. M. Barbarina, M. P. Sukhov, and N. A. Sheludyakov Nov. 7, 1963 176 p refs Transl. into ENGLISH of the book "Steklovoloknistyye Stroitel'nyye Materialy" Moscow, Gosstroyizdat, 1961
(JPRS-18380; OTS-63-21431) OTS: $3.00

Fiberglass and fiberglass products were studied and discussed. Included in the discussion were the physicomechanical and the physicochemical properties of the materials, which included volumetric weight, thermal conductivity, acoustic properties, chemical resistance, frost resistance, temperature resistance, filterability, and mechanical strength. Attention was also given to the fabrication and production of the principal types of fiberglass building materials and their use in construction. C.L.W.

N64-10646 Joint Publications Research Service, Washington, D.C.
GLASS PLASTICS
Boris Abramovich Apr. 24, 1963 59 p refs Transl. into ENGLISH of a book "Stekloplasty, Material budushchego" Moscow, Acad. of Sci. 1959 p 1–63
(JPRS-18890; OTS-63-21669) OTS: $1.50

A general review of glass-reinforced plastics is presented. The principal characteristics of glass fibers, synthetic resin binders, and the glass plastics based on them are described. The technology of glass-plastics production and the application of glass plastics in industry are also discussed. M.P.G.

20 MATHEMATICS

Includes calculation methods and theory; computers; data processing; and numerical analysis. *For related information see*: 08 Communications; 09 Electronics; 10 Facilities, Research and Support; and 22 Navigation and Guidance.

N64-10036 European Atomic Energy Community, Brussels (Belgium)

NUMERICAL RESOLUTION OF THE INTEGRAL TRANSFER EQUATION (NUMERICAL RESOLUTION OF MILNE'S PROBLEM IN AN NON-ABSORBENT MEDIUM) [RISOLUZIONE NUMERICA DELL'EQUAZIONE INTEGRALE DEL TRASPORTO (RISOLUZIONE NUMERICA DEL PROBLEMA DI MILNE IN MEZZO NON ASSORBENTE)]

B. Montagnini (Soc. AGIP Nucleare) and T. Pomentale (EURATOM) July 1963 45 p refs In ITALIAN; ENGLISH summary (Contract EURATOM 006-60-7 CET I)

(EUR 371.i) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 60 Belg. Fr.

This report represents the the first study for the solution of the integral transport equation. Milne's problem is considered

$$(1)\ \rho(x) = \frac{1}{2}\int_0^{\infty} \bar{E}1\,(|x - x^1|)\rho(x^1)dx^1$$

$$E\eta(x) = \int \bar{E}_1 \frac{e^{-xt}}{t^n}\,dt$$

for the halfspace $X \geqslant o$. The equation is transformed in two different ways: (a) through the knowledge of the asymptotic behavior of ρ (x), developing some calculations an equation approximating the (1) is obtained; (b) equation (1) is approximated supposing the multiplying mean to be constituted by a stratum (O.M) and simulating the space $x \geqslant M$ with suitable boundary conditions. The successive n-dimensional problems will be treated in the second way. The equations so obtained are studied numerically by searching suitable formulas for the integration approximated in such a way as to avoid kernel singularity. This is solved by integrating numerically near the singularity, and approximating the flux ρ out of the singularity by a step function. Author

N64-10047 Joint Publications Research Service, Washington, D.C.

RECENT SOVIET WORK ON FINITE AUTOMATA AND LINEAR PROGRAMMING

Oct. 14, 1963 20 p refs Transl. into ENGLISH of two articles from Doklady Akad. Nauk, SSSR, (Moscow), v. 151, no. 3, July 21, 1963 p 493–496 and p 515–518

(JPRS-21444; OTS-63-31938) OTS: $0.50

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1. THE CARDINAL NUMBERS OF SETS OF PRECOMPLETE CLASSES OF CERTAIN FUNCTIONAL SYSTEMS CONNECTED WITH AUTO-MATA V. B. Kudryavtsev (Moscow State U.) p 1–10 refs (See N64-10048 01-20)

2. MULTIDIMENSIONAL LINEAR PROGRAMMING PROBLEMS OF THE TRANSPORT TYPE B. S. Verkhovskiy (Inst. of Complex Transportation Problems, USSR) p 11–17 refs (See N64-10049 01-20)

N64-10048 Joint Publications Research Service, Washington, D.C.

THE CARDINAL NUMBERS OF SETS OF PRECOMPLETE CLASSES OF CERTAIN FUNCTIONAL SYSTEMS CONNECTED WITH AUTOMATA

V. B. Kudryavtsev (Moscow State U.) *In its* Recent Soviet Work on Finite Automata and Linear Programming Oct. 14, 1963 p 1–10 refs (See N64-10047 01-20) OTS: $0.50

Problems connected with the completeness of certain functional systems which describe the properties of automata are discussed. It is shown that for a certain natural choice of operations, the cardinal number of the set of all precomplete classes of bounded-determinate operators is equal to the continuum, whereas the logical cardinal number of determinate operators is equal to the hyper-continuum. It is noted that the first case holds even though the set of all bounded-determinate operators is countable and has a finite base. Several operations are described which, when applied to bounded-determinate operators, give a bounded-determinate operator. The following theorems are shown to be true: (1) the cardinal number m of the set of all precomplete classes of operators is equal to the continuum; and (2) the cardinal number of the set of all precomplete classes of determinate operators is equal to the continuum. P.V.E.

N64-10049 Joint Publications Research Service, Washington, D.C.

MULTIDIMENSIONAL LINEAR PROGRAMMING PROBLEMS OF THE TRANSPORT TYPE

B. S. Verkhovskiy (Inst. of Complex Transportation Problems, USSR) *In its* Recent Soviet Work on Finite Automata and Linear Programming Oct. 14, 1963 p 11–17 refs (See N64-10047 01-20) OTS: $0.50

The elements of an s-dimensional matrix, each cell of which is determined by the s coordinates (indexes) $i_1 \ldots i_s$, where the k-th coordinate has the value $i_k = 1,\ldots,n_k$; all $\geqslant 2$ are considered. The problem of determining all elements of the matrix $|x_{i_1}\ldots i_s|$ satisfying the conditions

$$\sum_{k \in Mj} X_{i_1}\ldots i_s = a_{j(i_1\ldots i_s)},\ X_{i_1}\ldots i_s \geqslant 0$$

and supplying the minimal functional

$$L = \sum_{k \in M} p_{i_1}\ldots i_s X_{i_1}\ldots i_s$$

was considered. Eight theorems were derived and proofs are presented. In addition, each of the problems is depicted schematically. R.T.K.

N64-10094* Martin Co., Baltimore, Md. RIAS Div.

PROLONGATIONS AND STABILITY IN DYNAMICAL SYSTEMS

J. Auslander and P. Seibert Sept. 1963 41 p refs

(NASA Contract NASw-718; Contracts AF 49(638)-1242 and DA-36-034-ORD-3514Z)

(NASA CR-52227; RIAS-TR-63-18) OTS: $4.60 ph, $1.43 mf

This report presents a unified theory of stability and boundedness in dynamical systems by means of prolongations. A map is considered, which associates to every point in the state space, the positive semiorbit issuing from it. The first prolongation is obtained by extending this map to one which is "closed," meaning that it maps every closed set onto a closed set. By alternating extensions to maps which are transitive and closed, respectively, a sequence of more and more extensive prolongations is obtained and, following Ura, a concept of stability is associated to each of these prolongations—A compact invariant set is called Q-stable if it is invariant under the prolongation Q. In particular, there exists a smallest prolongation which is both closed and transitive. The corresponding concept of stability is called absolute stability. It is proved that the existence of a continuous Liapunov function is necessary and sufficient for absolute stability. The duality of concepts of stability (in the sense of Liapunov) and boundedness

(Lagrange stability) is formalized by compacting the phase space, and thus from every stability theorem a corresponding boundedness theorem is obtained. I.v.L.

N64-10153 European Organization for Nuclear Research, Geneva (Switzerland)
LECTURES ON ELEMENTARY STATISTICS AND PROBABILITY
Derek J. Hudson Aug. 15, 1963 107 p refs
(CERN 63-29)

This set of six lectures is a summary of some of the principal results in the theory of random variables. The arguments used are based on the axioms of the theory of probability, which are presented in the classical way. Discrete and continuous distributions are defined, and at the end, the χ^2 and t distributions are evaluated. Moment generating functions are used as a tool to derive new distributions, and to give an abbreviated proof of the central limit theorem. Some statistical concepts are introduced which form the basis of the more advanced science of statistical inference. Author

N64-10174* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
THE N-BODY CODE – A GENERAL FORTRAN CODE FOR THE NUMERICAL SOLUTION OF SPACE MECHANICS PROBLEMS ON AN IBM 7090 COMPUTER
William C. Strack and Vearl N. Huff Washington, NASA, Nov. 1963 110 p refs
(NASA TN D-1730) OTS: $2.50

A general astronomical integration code designed for a large class of problems in space mechanics that may be solved by numerical integration is described. The equations of motion provide for the effects of up to eight gravitating celestial bodies, oblateness and aerodynamic forces from the celestial body at the problem origin, propulsion system thrust, and rotation of the body at the origin. The coding in this report is intended for use on an IBM 7090. Author

N64-10188 Los Alamos Scientific Lab., N. Mex.
THE FOURIER TRANSFORM OF $(x^2 + a^2)^{-1} (x^2 + b^2)^{-1/2}$
W. A. Beyer Nov. 4, 1963 14 p refs
(Contract W-7405-eng-36)
(LAMS-2975) OTS: $0.50

The Fourier transform of $(x^2 + a^2)^{-1} (x^2 + b^2)^{-1/2}$, $I(p) = \int_{-\infty}^{\infty} e^{ipx} (x^2 + a^2)^{-1} (x^2 + b^2)^{-1/2} dx$, is investigated. For I(p), an asymptotic series as $p \to +\infty$, a convergent series, and an expression in terms of nonoscillatory integrals are obtained. Author

N64-10191 Rochester U., N.Y.
GROUP THEORY AND MODERN ANALYSIS
F. R. Haig, T. F. Jordon, and A. J. Mac Farlane Aug. 29, 1963 443 p refs
(Contract AT(30-1)-875)
(URPA-1)

The purpose of this report is to present for physicists, in a readily intelligible form, a set of mathematical topics, drawn from group theory and modern analysis, which are currently of pressing importance in theoretical physics. Emphasis is largely on topics which thoroughly combine the algebraic and topological aspects. Topics discussed include: (1) finite groups, which provides only as much of the algebraic structure of group theory as will be required in the study of continuous groups; (2) topology, which provides the modern form of analysis required; (3) functional analysis, which presents an integrated development of the algebraic and topological properties of linear spaces and linear operators, thereby providing examples of the topological structures in a setting inherently interesting for theoretical physics; (4) the theory of the representation of groups in a modern setting; (5) Lie algebras; and (6) the development of a distribution theory based on the treatment of functional analysis in item (3). I.v.L.

N64-10196 Joint Publications Research Service, Washington, D.C.
A DECODING "DIGIT-TO-ANGLE" CONVERTER WITH INTERMEDIATE CONVERSION
N. A. Smirnov, V. B. Smolov, V. S. Fomichev, and Ye. A. Chernyavskiy Oct. 23, 1963 17 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedinii, Elektromekhan (Novocherkassk), no. 5, May 1963 p 597–604
(JPRS-21553; OTS-63-31989) OTS: $0.50

Digital converters of the compensation type, using standard components of alternating current tracking systems, as used aboard aircraft, are described. A design is also presented for a decoding digit-to-angle converter that is recommended whenever linear or functional code conversion into a turning angle is required, without too much stress on critical precision (up to 11 binary categories). R.T.K.

N64-10213 Union Carbide Nuclear Co., Oak Ridge, Tenn.
A COMPARISON OF COMPLETE VERSUS SELECTIVE PROGRAMMED INSTRUCTION IN A NONDESTRUCTIVE TESTING LABORATORY General, Miscellaneous, and Progress reports
R. T. Bell (M.S. Thesis–Tenn. U.) June 21, 1963 77 p refs
(AEC Contract W-7405-eng-26)
(Y-1442) OTS: $2.00

This report describes the objectives and requirements of a training program in which the relatively new method of programed instruction was employed. A determination was made of what areas should be taught, then the material was programed and presented to a group of 34 analysts presently engaged in the field of industrial radiography. Two courses were prepared. The first course was completely programed (conventional programing). The second course covered exactly the same material but only material deemed to be "analytical" in nature was programed (selective programing). Based on a statistical analysis of the data collected in this study, it was concluded that: both groups significantly improved their knowledge in industrial radiography, but there was no significant difference in the achievement, retention, or training time of analysts using a conventional program and a selective program. Author

N64-10214 Royal Netherlands Aircraft Factories Fokker, Amsterdam
PRACTICAL EXPERIENCE WITH POWER SPECTRAL METHODS ON A SMALL DIGITAL COMPUTER
F. Snoodijk and J. Yff [1963] 14 p refs Presented to the Intern. Symp. on Analogue and Digital Tech. appl. to Aeron. Liege, Sept. 9th–12th, 1963

The problems of applying power spectral methods to the calculation of wing gust loads when only a small digital computer is available, are dealt with. The frequency response functions had to be determined by firstly calculating the response to a step function input and finally applying the Fourier transform to these responses. Problems of accuracy of the numerical integration method, of the influences on the frequency response function of neglecting the tail of the response function, and of the required frequency interval size are dealt with. It is found that mean square values of gust loads depend

heavily on turbulence scale. However, overshoot factors determined in this way are nearly independent of turbulence scale and therefore can find their place in calculations according to airworthiness regulations. Author

N64-10215 Bettis Atomic Power Lab., Pittsburgh, Pa.
P3MG1 — A ONE-DIMENSIONAL MULTIGROUP P-3 PROGRAM FOR THE PHILCO-2000 COMPUTER AEC Research and Development Report
H. Bohl, Jr., E. M. Gelbard, B. L. Anderson, A. P. Hemphill, and B. P. Peterson Sept. 1963 108 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-TM-272) OTS: $2.25

P3MG1 is a one-dimensional multigroup program which treats fast neutrons by a spherical harmonics approximation up to P_3 and thermal neutrons by a double-P_1 approximation. P_3 elastic scattering is treated exactly for hydrogen only, with the option of including the P_2 and P_3 components of the scattering cross section for other isotopes in the total and transport cross sections. The formulation of the equations permits three geometries—rectangular, cylindrical, and spherical. Author

N64-10221 Iowa State U. of Science and Tech., Ames Ames Lab.
ADDSTORAGE FORTRAN FOR THE IBM 7074/2/4
D. R. Fitzwater, E. H. Hietbrink, and D. E. Mc Farland Sept. 1963 28 p refs
(Contract W-7405-eng-82)
(IS-721) OTS: $0.75

The problem considered in this paper is the modification of the IBM 7070 Series Compiler System to compile FORTRAN programs to be run in addstorage mode. This paper is written in the form of a programing systems-analysis guide. Author

N64-10222 Iowa State U. of Science and Tech., Ames Ames Lab.
METHOD FOR THE SOLUTION OF THE ALGEBRAIC EIGEN PROBLEM FOR THE IBM 7074 COMPUTER
William J. Higby Sept. 1963 27 p refs
(Contract W-7405-eng-82)
(IS-748) OTS: $0.75

A technique for the solution of the algebraic eigen problem $Ax = \lambda x$ for large, real, symmetric matrices is presented. A program for the IBM 7074 computer that computes the eigenvalues and eigenvectors of real symmetric matrices is introduced. The mathematical method is shown, and the transformation of this method to the machine level is discussed. In particular, the concept of list processing for this scientific application is presented, as well as the technique for matrix manipulation using the list structure. Author

N64-10352 Joint Publications Research Service, Washington, D.C.
ALGORITHMIC PROBLEMS IN PARTIALLY ORDERED GROUPS
V. I. Frenkel' Nov. 18, 1963 8 p refs Transl. into ENGLISH from Doklady Akad. NAUK SSSR (Moscow), v. 152, no. 1, 1963 p 67–70
(JPRS-21898; OTS-63-41154) OTS: $0.50

This article deals with the solution of algorithmic problems arising in the partial ordering of finitely defined groups, and in the representation of partially ordered groups by a finite number of elements and a finite number of defining inequalities. A precise description of such representation of partially ordered groups is given. Author

N64-10367 Polish Academy of Sciences, Warsaw. Mathematical Inst.
BIBLIOGRAPHY OF POLISH MATHEMATICS, 1944-1954
1963 136 p refs Warsaw, Central Inst. for Inform. on Tech. and Economic Studies Transl. into ENGLISH from Roczink. Polsk. Towarz. Matematycznego. Ser. II: Wiadomosci Matematyczne
(OTS-61-11300) OTS: $1.25

A bibliography is presented of Polish mathematical papers on various areas of mathematics. Each chapter begins with an analytical part, containing a characterization of the problems investigated and quotes of the main achievements. Areas of mathematics included are: (1) the theory of sets and mathematical logic, (2) topology, (3) functional analysis, (4) real functions, (5) differential equations, integral equations, and variational calculus, (6) analytic functions, (7) geometry, (8) algebra and theory of numbers, (9) theory of probability, (10) theoretical mechanics, technical applications, and mathematical apparatus, and (11) history, teaching, popularization, and organization of mathematics. P.V.E.

N64-10424 Centralny Inst. Informacji Naukowo-Technicznej i Ekonomicznej, Warsaw (Poland)
ELEMENTS OF MATHEMATICAL LOGIC [ELEMENTY LOGIKI MATEMATYCZNEJ]
Jan Lukasiewicz Warsaw, Polish Sci. Publishers [1963] Transl. into ENGLISH 132 p refs
(OTS-61-11302) OTS: $1.50

This book on the elements of mathematical logic covers the following subjects: (1) introduction—trends in mathematical logic, mathematical logic versus philosophical logic, and theorems and rules of inference, the sentential logic and the term logic; (2) the sentential calculus—the primitive terms and the axioms, definitions, rules of inference, and theorems of the sentential calculus; (3) selected problems from the methodology of the sentential calculus—the consistency and the independence of axioms of the sentential calculus, many-valued logic, the completeness of the sentential calculus; (4) the sentential calculus with quantifiers—quantifiers, rules of inference and theses; and (5) Aristotle's syllogistic—axioms, definitions, rules of inference, and theses of Aristotle's syllogistic. R.T.K.

N64-10429 Bettis Atomic Power Lab., Pittsburgh, Pa.
AN ALTERNATING DIRECTION METHOD FOR OPERATORS WITH AN APPLICATION TO THE TRANSPORT EQUATION
R. B. Kellogg Oct. 1963 45 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-TM-391) OTS: $1.00

The Peaceman–Rachford iterative method is studied for the solution of operator equations on a Hilbert space. The method is applied to the one group inhomogeneous transport equation in rectangular and cylindrical geometry. Author

N64-10437* Smithsonian Astrophysical Observatory, Cambridge, Mass.
LAPLACE COEFFICIENTS AND THEIR NEWCOMB DERIVATIVES. RESEARCH IN SPACE SCIENCE
Imre G. Izsak July 15, 1963 57 p refs
(NASA Grant NsG-87-60)
(NASA CR-52537; SAO Special Rept. 129) OTS: $5.60 ph, $1.91 mf

A description of a computation procedure, with the derivation of the basic equations and graphs, obtained on an EAI dataplotter, illustrating the behavior of the Laplace coefficients and their Newcomb derivatives, is presented. These coefficients

and derivatives play an important role in the literal development of the planetary disturbing function. Graphs showing the behavior of the functions $D^j b_k$ in the interval $0.1 \leq \alpha \leq 0.9$, for k = 0,1,...,16 and j = 0,1,...,12. Where the Laplace coefficients $b_k^s(\alpha)$ are defined as the coefficients in the Fourier expansion of the generating function

$$s^{-1/2}(1 - 2\alpha\cos\Psi + \alpha^2)^{-s} = b_0^s(\alpha) + 2\sum_{k=1}^{\infty} b_k^s(\alpha)\cos k\Psi;$$

on the left side of the equation the symbol s means an exponent, but on the right side, just an upper index and the range of the range of the argument α is $0 < \alpha < 1$. P.V.E.

N64-10454 Joint Publications Research Service, Washington, D.C.
REVIEW OF CIBERNETICA (CYBERNETICS)
V. Strat Mar. 19, 1963 4 p Transl. into ENGLISH from Telecomunicatii (Bucharest), v. 6, no. 6, Nov.–Dec. 1962 p 285
(JPRS-18226; OTS-63-21365) OTS: $0.50

A review of a book dealing with problems, methods, and application of results obtained in the field of science in automation, biology, and medicine is presented. P.V.E.

N64-10458 Joint Publications Research Service, Washington, D.C.
PRINCIPLES OF ACCOMPLISHING LEARNING AND LOGICAL PROCESSES IN AUTOMATIC EQUIPMENT
P. Neidhardt (Chamber of Tech., E. Berlin) May 10, 1963 22 p Transl. into ENGLISH from Technik (E. Berlin), v. 18, no. 4, Apr. 1963 p 277–281
(JPRS-19134; OTS-63-21797) OTS: $0.75

The working principles of the electronic realization of the principle of logical combinations and of the learning process by means of binary and nondigital learning matrices are discussed. Fundamentals of the algebra of logic and of the principles of logical combinations are discussed in the following areas: (1) negation or inversion, (2) conjunction, (3) alternative or disjunction, (4) implication, (5) equivalence, (6) antivalence, (7) reverse switches with triodes, transistors, and ferrite cores (negators), (8) and-gates as the electronic realization of conjunction in logistic algebra, and (9) or-gates as the electronic realization of the disjunction of logistic algebra. P.V.E.

N64-10475 Joint Publications Research Service, Washington, D.C.
IDEALIZED AND PRACTICAL PANDEMONIUM
S. F. Kozubovs'kyy Feb. 1, 1963 14 p refs Transl. into ENGLISH from Avtomatyka (Kiev), v. 7, no. 4, 1962 p 80–85
(JPRS-17432; OTS-63-21043) OTS: $0.50

The theory concerning an instrument for obtaining idealized pandemonium is discussed. The data or images which must be distinguished are fed to the input of the instrument. To each possible image which belongs to a certain number, there corresponds a functional block (subprogram) which is imagined to be in the form of a demon in a box. The image, which is being distinguished, is presented uniformly "for examination" by all the demons. Each demon calculates the degree of his resemblance to the image that has been shown, and gives an output signal uniformly connected with the degree of its resemblance. The upper "decision demon" selects the image that belongs to the demon whose output signal is the greatest. The application of this instrument for the automatic improvement of the processing of data during the recognition of images was tested by setting up the task of distinguishing the dots and dashes of letters of the Morse-code alphabet. P.V.E.

N64-10487 Joint Publications Research Service, Washington, D.C.
LENIN PRIZE AWARDED TO SOVIET MATHEMATICIANS
D. V. Anosov Feb. 19, 1963 5 p Transl. into ENGLISH from Priroda (Moscow), no. 12, Dec. 1962 p 46–49
(JPRS-17718; OTS-63-21168) OTS: $0.50

An explanation and a short discussion are given of the basic ideas developed and the results achieved by recipients of Lenin prizes which were awarded to a group of scientists for their outstanding achievements in the development of some of the branches of mathematics having both theoretical and applied significance. Academician L. S. Pontryagin, R. V. Gamkrelidze, Ye. F. Mishchenko, and V. G. Boltyanskiy, Doctor of Physico-mathematics, received Lenin prizes for their works on ordinary differential equations and their application to the theory of optimum control and the theory of variations. V. M. Levimen and V. A. Marchenko were honored for their series of works on reciprocal problems in spectrum analysis of differential operations, and A. V. Pogorelov received the award for research in geometry. C.L.W.

N64-10497 Joint Publications Research Service, Washington, D.C.
SCIENTIFIC ACTIVITIES OF THE INTEGRAL EQUATIONS SECTION OF THE MATHEMATICS INSTITUTE, POLISH ACADEMY OF SCIENCES
Witold Pogorzelski (Pol. Acad. Sci.) Mar. 13, 1963 12 p refs Transl. into ENGLISH from French-language pamphlet 19, Paris Sci. Center of the Polish Acad. Sci., 1961 p 3-12
(JPRS-18087; OTS-63-21305) OTS: $0.50

The most important results of the scientific activity of the section on integral equations were concerned with the following topics: (1) properties of solutions and limit problems for elliptical and parabolic equations—the limit problems investigated were concerned with the tangential derivatives of the unknown function; (2) properties of curvilinear singular integrals and problems with discontinuous limits in the theory of analytic functions—some linear and nonlinear problems with discontinuous limits under very general hypotheses concerning the limit functions and boundary lines were investigated; and (3) properties of singular integrals in space and their applications—a problem with discontinuous tangential derivatives for a harmonic function in space was solved. R.T.K.

N64-10499 Joint Publications Research Service, Washington, D.C.
PROBLEMS IN BOOLEAN ALGEBRA AND IN USING TURING MACHINES
N. V. Belyakin (Acad. Nauk USSR, Siberan Branch) and E. I. Nechiporuk (Leningrad U.) Mar. 20, 1963 20 p refs Transl. into ENGLISH of 2 articles from Doklady Akad. Nauk SSSR (Moscow), v. 148, no. 1, 1963 p 47–49 and 5–53
(JPRS-18244; OTS-63-21370) OTS: $0.50

Two articles are presented. The first considers a class of Turing machines related to machines without erasure. A set of operators was established in order to evaluate the performance of the calculating potentialities of such machines. The second article considers the problem of the realization of Boolean matrices by gates. R.T.K.

N64-10502 Joint Publication Research Service, Washington, D.C.
MATHEMATICAL METHODS FOR PROCESSING STATISTICAL DATA

G. Kil'kishev and V. Ovsiyenko Mar. 25, 1963 9 p refs Transl. into ENGLISH of book review from Vopr. Ekon. (Moscow), no. 12, 1962 p 114–117 Book reviewed is "Vyravnivaniye i vychisleniye ryadov raspredeleniy" by A. I. Yezhov Moscow, State Statist. Publ. House, 1961 336 p
(JPRS-18338; OTS-63-21416) OTS: $0.50

The book reviewed consists of two parts. The first is devoted to explaining the methodology for devising distribution series, and also the methods for equating them, and the second deals with the questions of computing these theories on the basis of only certain statistical characteristics or estimates which are available to the researcher. The author of the book concludes that for devising distribution series one must know only the total number of aggregate units and a limited number of other characteristic features of the discreet distribution series. P.V.E.

N64-10511 Joint Publications Research Service, Washington, D.C.
A METHOD OF CONSTRUCTING AN ALGORITHM SIMULATING A CERTAIN PRODUCTION PROCESS
I. S. Lyubchenko and I. Ye. Mayzlin June 10, 1963 7 p refs Transl. into ENGLISH from Doklady Akad. Nauk SSSR (Moscow), v. 148, no. 3, 1963 p 538-540
(JPRS-19621; OTS-63-22016) OTS: $0.50

A universal method is presented for the formalization of production processes. The algorithm considered simulates the operation of a mechanized section of production processes, and affords the possibility of carrying out a broad analysis of a given technological process and of solving the following problems: (1) to estimate the structure of the investigated system and to select the optimum composition of the equipment; (2) to determine the optimum regions of equipment operation on the basis of an analysis of the production system, the quality indices of the production, the reliability of equipment operation, and other characteristics; (3) for given values of the system parameters to compute its productive possibilities taking random factors into account; and (4) to estimate the effect of deviations in the system parameters on its functioning. P.V.E.

N64-10544 Army Missile Test and Evaluation Directorate, White Sands Missile Range, N. Mex. Flight Simulation Lab.
TECHNIQUES FOR MAPPING NON-LINEAR VECTOR-DYADIC FLIGHT SYSTEM EQUATIONS OF STATE-VECTOR FORM FOR COMPUTER MECHANIZATION
James S. Pappas and Jesus E. Carrillo Oct. 3, 1963 54 p refs (Tech. Note 41; AD-423057)

State-vector methods for mathematically representing aerospace flight systems are rapidly becoming accepted practice. Modern multivariable optimal control system design studies extensively utilize matrix analysis. This report presents techniques for mapping the nonlinear invariant vector-dyadic system design equations to state-vector form, thereby furnishing a most convenient guide for computer mechanization and solution of these complex systems. Author

N64-10550 Computer Associates, Inc., Wakefield, Mass.
BOUNDED CONTEXT SYNTACTIC ANALYSIS Scientific Report No. 3
Robert W. Floyd Sept. 1963 13 p refs
Contract AF 19(628)-419)
(AFCRL-63-399; AD-422564)

Certain phrase structure grammars define languages in which the phrasehood and structure of a substring of a sentence may be determined by consideration of only a bounded context of the substring. It is possible to determine, for any specified bound on the number of contextual characters considered, whether a given grammar is such a bounded context grammar. Such grammars are free from syntactic ambiguity. Syntactic analysis of sentences in a bounded context language may be performed by a standard process, and requires a number of operations proportional to the length of sentence analyzed. Bounded context grammars form models for most languages used in computer programing, and many methods of syntactic analysis, including analysis by operator precedence, are special cases of bounded context analysis. Author

N64-10584 Joint Publications Research Service, Washington, D.C.
GAME BETWEEN A FINITE AUTOMATON AND A PARTNER USING MIXED STRATEGY
M. L. Tsetlin May 17, 1963 7 p refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 149, no. 1, 1963 p 52–53
(JPRS-19243; OTS-63-21840) OTS: $0.50

The example of an automaton's behavior in this note refers to a case of a game between two persons having a zero sum for which the well-known von Neumann theorem is applicable. Assuming that one of the players will use an arbitrary mixed strategy and that the other is the finite automaton, an automaton is constructed which has a sufficient memory capacity so that it "does not play worse" than its partner (when there is observed and additional condition determined by the matrix of the game). In addition to the theorems of von Neumann, the results and concepts of Tsetlin were used. R.T.K.

N64-10585 Joint Publications Research Service, Washington, D.C.
THE USE OF ELECTRONIC ANALOGUE COMPUTERS IN SOME EXTREMAL PROBLEMS
G. V. Savinov and R. A. Velershteyn May 17, 1963 13 p refs Transl. into ENGLISH of an article from Vestn. Mosk. Univ. (Moscow), no. 1, 1962 p 60–67
(JPRS-19244; OTS-63-21841) OTS: $0.50

Electronic analog computers are used to solve problems in mathematical physics, vibration theory, and also game theory. A given continuous function $\phi(x_1,\ldots,x_n)$ having a predetermined range of values of the variables $x_1,\ldots,x_2$ is solved for the point $x^0_1, x^0_2,\ldots x^0_n$ of this region at which the function $\phi(x_1,\ldots,x_n)$ has an extremal value, that is, a maximum or a minimum value, in comparison with all the points of that region located quite close to the point $x^0_1, x^0_2,\ldots x^0_n$. C.L.W.

N64-10628 Joint Publications Research Service, Washington, D.C.
STUDY OF AUTOMATIC DRIVING SYSTEMS BY SIMULATION
S. P. Gel'fenbeyn Feb. 7, 1963 14 p refs Transl. into ENGLISH of an article from Vestn. Sel'skokhoz., Moscow, no. 11 1962 p 105–110
(JPRS-17525; OTS-63-20173) OTS: $0.50

A system of automatic driving of a crawler-mounted plowing unit was studied by means of an analog computer. Results are as follows: (1) Mathematical modeling by analog computers provides a comparatively simple method for studying nonlinear systems of automatic driving with a zone of nonsensitivity and delay. It is easy to vary the parameters of individual elements of the system in order to determine the effect of these changes on the quality of operation of the system as a whole, and to determine the zone of the optimum value of the parameters. (2) Mathematical modeling establishes the optimum place to locate the copying device (it can be inscribed in the

dimensions of the tractor without jutting too far forward), the amplification coefficient of the copying device (length of distortion of the copying feeler), the best scheme for connecting the tractor with the plow (single point flexible-joint connecting), and the optimum place to connect the plow to the tractor (in the field of momentary pole of turn of the tractor). Also, a study of automatic driving using a linear system is discussed. I.v.L.

N64-10636 Joint Publications Research Service, Washington, D.C.
ADDRESS LANGUAGE IN COMPUTER PROGRAMMING
K. L. Yushchenko Mar. 4, 1963 6 p refs Transl. into ENGLISH of an article from Dopovidi Akad. Nauk Ukr. RSR (Kiev), no. 10, 1962 p 1305–1307
(JPRS-17911; OTS-63-21239) OTS: $0.50

An expanded address language is proposed which can be used to represent the basic algorithm which, with appropriate coding, makes possible the recording of any conceivable algorithm. A form is developed with which the algorithm of any machine can be written. P.V.E.

N64-10665 Union Carbide Nuclear Co., Oak Ridge, Tenn.
CENTERING CORRECTION FOR THE INSPECTION OF OFF-CENTER PARTS HAVING ROTATIONAL SYMMETRY
W. P. Amsbury and W. W. Lee Nov. 11, 1963 21 p
(Contract W-7405-eng-26)
(Y-1445) OTS: $0.50

A mathematical analysis is made of the signal generated by a poorly centered part during inspection. The centering error is found to be closely represented by the first harmonic terms of a Fourier series, and circuitry is developed to remove these terms from the inspection signal. A method is thereby developed for obtaining part deviations with reduced operator time. Author

21 METEOROLOGY

Includes climatology; weather forecasting; and lower atmosphere studies. *For related information see*: 05 Astronomy and Astrophysics; 12 Geophysics; and 29 Space Sciences.

N64-10011 Weather Bureau, Washington, D.C. Meteorological Satellite Lab.
A TECHNIQUE FOR PRECISE ANALYSIS FOR SATELLITE DATA: VOLUME I – PHOTOGRAMMETRY
Tetsuya Fujita Jan. 1963 113 p refs
(Contract Cwb 10215)
(MSL Rept. 14)

A technique for precise rectification of satellite cloud photographs is reported. The various factors influencing precise rectification are discussed, including: (1) the shape of the earth and the orbital characteristics of earth-orbiting satellites related to the three coordinate systems conveniently used in the analysis; (2) the characteristics of TIROS-borne cameras; (3) map projections and their matching overlays; and (4) the attitude of a satellite with respect to the sun and earth. Next, a step-by-step explanation is presented of the precise rectification method, which can be used if a landmark exists in one photograph of a series to be rectified. An approximate method applicable to any series of satellite photographs is also presented. These techniques have been tested for various TIROS photographs, with or without landmarks, and the error normally did not exceed 0.2 degrees of the great-circle arc. M.P.G.

N64-10059* National Aeronautics and Space Administration, Washington, D.C.
SELECTED PAPERS ON NOCTILUCENT CLOUDS
Nov. 1963 63 p refs Transl. into ENGLISH from Six Russian articles published during the IGY
(NAS TT F-84) OTS: $1.75

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3. THE NATURE OF NOCTILUCENT CLOUDS I. A. Khvostikov p 14–17 refs (See N64-10062* 01-21)
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5. DATA CONCERNING THE FREQUENCY OF APPEARANCE OF NOCTILUCENT CLOUDS OVER THE WESTERN SECTOR OF THE USSR L. F. Gromova p 35–42 refs (See N64-10064* 01-21)
6. PHOTOMETRIC CONDITIONS IN RESPECT TO THE VISIBILITY OF NOCTILUCENT CLOUDS V. V. Sharonov p 43–60 refs (See N64-10065* 01-21)

N64-10060* National Aeronautics and Space Administration, Washington, D.C.
THE NATURE OF NOCTILUCENT CLOUDS
V. A. Bronshten *In its* Selected Papers on Noctilucent Clouds Nov. 1963 p 1–6 refs Transl. into ENGLISH from Certain Problems Regarding Meteorology; Collection of Articles, Second Sect. IGY, no. 1; Acad. Sci. (Moscow), 1960 p 120-123 (See N64-10059* 01-21) OTS: $1.75

The validity of the dust hypothesis and the condensation hypothesis as attempts to explain the nature of noctilucent clouds is examined. The permanency of noctilucent clouds' altitude, the latitude limitation of their occurrence, the seasonal limitation of their visibility, the connection between noctilucent cloud appearance with meteorological conditions in the troposphere, the cloud structure, and certain particularities of the noctilucent cloud spectrum, must be satisfied by any hypothesis. The dust hypothesis is rejected because it cannot meet any of these criteria with any appreciable degree of certainty. However, the condensation hypothesis explains the altitude limitation of noctilucent clouds, the constancy of their altitude, their connection with meteorological phenomena, and all the peculiarities of their spectrum structure. A discussion of the condensation hypothesis as the key to the understanding of the cause of latitude and seasonal limitations of noctilucent cloud occurrence is included. J.E.T.

N64-10061* National Aeronautics and Space Administration, Washington, D.C.
WAVE MOVEMENTS AND METEOROLOGICAL CONDITIONS IN REGARD TO THE APPEARANCE OF NOCTILUCENT CLOUDS
N. I. Grishin *In its* Selected Papers on Noctilucent Clouds Nov. 1963 p 7–13 refs Transl. into ENGLISH from Certain Problems Regarding Meteorology; Collection of Articles, Second Sect. IGY Program, No. 1; Acad. Sci. (Moscow), 1960 p 117-119 (See N64-10059* 01-21) OTS: $1.75

Movie-filming of noctilucent clouds turned out to be the best method of observing the wave movements of these clouds. The stereoscopic viewing of two photographs of the same area of noctilucent clouds obtained by ordinary photography, or at small intervals from a single point, allows the best results. The appearance of noctilucent clouds is preceded by an increase in atmospheric pressure in the region below, quite independently from the general anticyclone direction in the neighboring days. The velocity and the surface covered by the directed isobar displacement are directly proportional to the brightness and the propagation area of the noctilucent clouds. J.E.T.

N64-10062* National Aeronautics and Space Administration, Washington, D.C.
THE NATURE OF NOCTILUCENT CLOUDS
I. A. Khvostikov *In its* Selected Papers on Noctilucent Clouds Nov. 1963 p 14–17 refs Transl. into ENGLISH from Certain Problems Regarding Meteorology; Collection of Articles, Second Sect. IGY Program, No. 1; Acad. Sci. (Moscow), 1960 p 112–114 (See N64-10059* 01-21) OTS: $1.75

The dust hypothesis and the condensation hypothesis are the two viewpoints regarding the origin of noctilucent clouds, which so far remains unsolved. The dust hypothesis ascribes their origin to dust particles, mostly of meteor origin, while the condensation hypothesis ascribes their origin to ice crystals. However, these two hypotheses may be combined if the role of dust particles from volcanic eruptions is considered. Although the condensation hypothesis appears to be more favorable, some observers feel that the water vapor content of the atmosphere at the prevailing altitude of noctilucent clouds is not sufficient for their formation. J.E.T.

N64-10063* National Aeronautics and Space Administration, Washington, D.C.
PROBLEMS AND METHODS OF INVESTIGATING NOCTILUCENT CLOUDS BY MEANS OF ABSOLUTE PHOTOMETRY
V. V. Sharonov *In its* Selected Papers on Noctilucent Clouds Nov. 1963 p 18–34 refs Transl. into ENGLISH from Problems Regarding Meteorology; Collection of Articles, Second Sect. IGY Program, No. 1; Acad. Sci. (Moscow), 1960 p 124–140 (See N64-10059* 01-21) OTS: $1.75

The problems and methods of measuring the brightness of noctilucent clouds and associated techniques for visual and photographic photometry are examined. J.E.T.

N64-10064* National Aeronautics and Space Administration, Washington, D.C.
DATA CONCERNING THE FREQUENCY OF APPEARANCE OF NOCTILUCENT CLOUDS OVER THE WESTERN SECTOR OF THE USSR
L. F. Gromova *In its* Selected Papers on Noctilucent Clouds Nov. 1963 p 35–42 refs Transl. into ENGLISH from IGY; Collection of Articles and Materials; Leningrad U. Press, 1960 p 5–11 (See N64-10059* 01-21) OTS: $1.75

A statistical analysis of noctilucent cloud appearance from observations published in the literature from 1885 to 1956 is presented. Conclusions are: (1) these clouds appear only in the warm part of the year, from April to October; (2) the maximum frequency of appearance is during the first-half of July; (3) the latitude interval of observation is from 45 to 60 degrees north; (4) within this latitude interval, the frequency of their appearance increases with latitude, reaching a maximum at 55 degrees, and then diminishing, reaching 0 at the 65 degree zone; and (5) observation becomes unfavorable at latitudes greater than 60 degrees north. J.E.T.

N64-10065* National Aeronautics and Space Administration, Washington, D.C.
PHOTOMETRIC CONDITIONS IN RESPECT TO THE VISIBILITY OF NOCTILUCENT CLOUDS
V. V. Sharonov *In its* Selected Papers on Noctilucent Clouds Nov. 1963 p 43–60 refs Transl. into ENGLISH from IGY; Collection of Articles and Materials; Leningrad U. Press, 1960 p 12–23 (See N64-10059* 01-21) OTS: $1.75

The difficulties of distinguishing noctilucent clouds from other atmospheric formations, the extremely specific conditions of illumination required for their observation, and photometric techniques for their recording are discussed. J.E.T.

N64-10216 Hazleton Nuclear Science Corp., Palo Alto, Calif.
RADIOCHEMICAL FALLOUT STUDY OF A PACIFIC CYCLONIC STORM [Precipitation collection made on Feb. 7, 1962]
Paul Kruger and Albert Miller May 31, 1963 32 p refs
(Contract AT(04-3)-457)
(HNS-17)

Continuous collections of precipitation were made at altitudes of sea level, 2,000 and 4,000 feet. Three sites exhibited similar Sr^{90} deposition patterns. Concentrations ranged from over 100 dpm/l to less than 1 dpm/l with several changes of over a factor of ten within hourly periods. The large variations of the Sr^{90} concentration in the precipitation at the three altitudes have been linked to the atmospheric changes during the storm with the aid of a detailed vertical time section. Observations are made of the effects of saturation of the lower layers of air, the overturning of the marine layer, the approaches of the frontal and upper trough zones, the gradual vertical growth of the cloud system up to the tropopause, and the incursions of high-level layers of dry air. Author

N64-10324 Joint Publications Research Service, Washington, D.C.
CONTRIBUTIONS TO AN ELECTRICAL THEORY OF TORNADOES
A. Puehringer Oct. 7, 1963 11 p refs Transl. into ENGLISH of an article from Arch. Meteorol., Geophys. Bioklimatol., Ser. A (Vienna), v. 13, nos. 3–4, 1963 p 450-460

The author shows that thunderstorm theory, based on electromagnetic induction, is also applicable to the tornado problem. The strongest argument in favor of the effectiveness of electromagnetic induction may be considered the observation of a rhomb-shaped thunderstorm cloud which generated several tornadoes. Such a cloud can be explained by the spatial distribution of its dipole elements. Author

N64-10460 Joint Publications Research Service, Washington, D.C.
RELATIONSHIP BETWEEN WINDS AND SURFACE CURRENTS IN THE COASTAL WATERS OF CHINA
Kuang Pin-hsien July 5, 1963 15 p refs Transl. into ENGLISH from the publ. "Sb. Dokl. II Plenume Komis. Rybokhozyaystvennomulssled. Zapad. Chasti Tikhogo Okeana". Moscow, 1962 p 31–40
(JPRS-20031; OTS-63-31208) OTS: $0.50

The relationship between winds and surface currents in the coastal waters of China was investigated. Results indicate that: (1) The surface currents along the coastal zone of China represent a single unified system along the entire Chinese coastline from the Gulf of Chihli (Pohai) in the north to the South China Sea in the south. The warm Taiwan Current, as well as currents which are affected by coastal contours, acts to differing degrees on other sea currents and winds. (2) The warm

Taiwan Current and its "offshoots" pass through regions of the sea which are considerably removed from the shore. This system of currents also undergoes seasonal changes, the understanding of which is of great value in studying ocean currents in the coastal zone of China. I.v.L.

N64-10485 Joint Publications Research Service, Washington, D.C.
RADIOACTIVE TUNGSTEN IN THE ATMOSPHERE
B.V. Kurchatov, V. N. Lavrenchik, and V. M. Shubko Feb. 18, 1963 15 p refs Transl. into ENGLISH of an article from Atomnaya Energ. (Moscow), v. 13, no. 6, 1962 p 576–580
(JPRS 17679; OTS 63-21147) OTS: $0.50

A determination of W^{181} concentration with the aid of a gamma-spectrometer, and of W^{185} with the aid of a beta-counter, made it possible to fix the data of formation of these products. The geographic distribution of concentrations of radioactive tungsten repeats in general the distribution of the products of fission fragments. However, the residence time of tungsten in the stratosphere proved shorter than that of the products of fission fragments. The total activity of radioactive W dumped into the stratosphere was estimated at 900 mc.
Author

N64-10486 Joint Publications Research Service, Washington, D.C.
USE OF THE "LADOGA" PHOTOTELEGRAPHIC APPARATUS FOR RECORDING DEPTHS MEASURED BY FATHOMETERS
G. B. Udintsev, G. N. Lunarskiy, V. I. Marakuyev, L. G. Barinov, and V. N. Sedel'nikov Feb. 19, 1963 19 p refs Transl. into ENGLISH from Okeanologiya (Moscow), v. 2, no. 6, 1962 p 1093–1103
(JPRS-17712; OTS-63-21162) OTS: $0.50

The "Ladoga" model FTAK-2p phototelegraphic apparatus was designed for the reception of weather maps and textual material of black-and-white and half-tone images; it can also be used in wire and radio-channel communications. In order to adapt the "Ladoga" apparatus for registration of the depths measured by means of a fathometer, several changes were needed in the mechanism and electrical circuits of the two instruments. The redesigning of the "Ladoga" apparatus and of the fathometer is presented in detail. The combination of the "Ladoga" automatic recorder with fathometers has proved successful, and materials concerning the profile of the ocean bottom have been obtained. R.T.K.

N64-10540 Freie U., Berlin (Germany) Inst. für Meterologie und Geophysik
OBJECTIVE ANALYSIS AND FORECASTING OF TOTAL CLOUD AMOUNTS Technical (Final) Report
J. R. Clauss July 30, 1963 32 p ref
(Contract AF 61(052)-544)
(AFCRL-63-720; AD-421797)

The expectancies for fair weather after one to five days at 1200 Gmt were investigated for the parameters: pressure, geopotential and thickness of 500-mb level, characteristics systems of the surface and upper-air chart, direction of geostrophic wind of the surface chart and of upper wind at 500 mb, if they were prevailing on day zero at 1200 Gmt.
Author

N64-10541 Stanford Research Inst., Menlo Park, Calif.
PRELIMINARY EXAMINATION OF DAYTIME RADIATION DATA FROM TIROS III OVER CLOUDY REGIONS Scientific Report 1
William Viezee and Paul A. Davis Aug. 1963 33 p refs
(Contract AF 19(628)-2777)
(AFCRL-63-860; AD-420243)

Samples of listed radiation data for three channels (2, 3, and 5) from TIROS III are examined in conjunction with cloud photographs. Although the effective temperatures for the window channel (Channel 2) and the computed albedos for the visible channel (Channel 5) depict the clear and cloudy regions, apparent variations in cloud density are not described adequately by either channel alone. Instrumental uncertainties remain in the data, especially for Channel 3 and, to a lesser extent, for Channel 5. Consequently, analyses of data from these channels emphasize relative variations rather than absolute values.
Author

N64-10570 Joint Publications Research Service, Washington, D.C.
TRANSLATIONS FROM METEOROLOGY AND HYDROLOGY (USSR), NUMBER 12, 1962 [METEOROLOGIYA I GIDROLOGIYA]
Mar. 14, 1963 119 p refs Transl. into ENGLISH of 15 articles
(JPRS-18141; OTS-63-21328) OTS: $2.50

Topics of discussion include: (1) determination of the movement, heat, and moisture of turbulent flows according to given gradient data; (2) a method for predicting humidity, cloud cover, and precipitation fields; (3) thermodynamic characteristics of the boundary layer during fog and low cloud cover; (4) a method for calibrating a radar set by rainfall intensity; (5) turbulence measurements on high-speed aircraft; and (6) a bibliography of literature on meteorology, hydrology, and oceanology published in 1961. J.E.T.

N64-10613* Army Electronics Research and Development Activity, White Sands Missile Range, N. Mex.
METEOROLOGICAL DATA REPORT, AEROBEE NE 3.127
Marjorie Mc Lardie Hoidale Aug. 1963 34 p refs
(NASA CR-52377; ERDA-65) OTS: $3.60 ph $1.22 mf

Meteorological data gathered for the launching of Aerobee NE 3.127 are presented along with calculated ballistic data.
Author

22 NAVIGATION AND GUIDANCE

Includes autopilots; star tracking; inertial platforms; and air traffic control. *For related information see*: 06 Auxiliary Systems; 08 Communications; 09 Electronics; 10 Facilities, Research and Support; 15 Instrumentation and Photography; 20 Mathematics; and 29 Space Sciences.

N64-10103* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
LUNAR FLIGHT STUDY SERIES. VOLUME 2: EARTH-MOON TRANSIT STUDY BASED ON EPHEMERIS DATA AND USING BEST AVAILABLE COMPUTER PROGRAM. PART 2: RETURN FLIGHT TO EARTH FROM LUNAR ORBIT
Arthur J. Schwaniger Nov. 8, 1962 45 p refs
(NASA TM X-51082; MTP-AERO-62-79) OTS: $4.60 ph $1.55 mf

The problem of return to earth from an orbit about the moon has been investigated. The orbit is assumed to be retrograde (opposite the moon's rotation) and inclined to the lunar equator by not more than 20 degrees. The method of trajectory calculation used takes account of the ephemerides

of earth, moon, and sun. Injection conditions for return from the orbit to the desired reentry conditions are determined, and the use of this data in establishing nominal return conditions and "injection window" is illustrated. Author

N64-10127 Litton Industries, Inc., Woodland Hills, Calif. Guidance and Control Systems Div.
LOW-COST INERTIAL NAVIGATION SYSTEMS FOR AIRCRAFT
Harold F. Erdley 1963] 19 p Presented at The Inst. of Navigation Low-Cost Navigation Symp., Los Angeles, Nov. 6–7, 1963

An inertial navigation system test in a transatlantic jet aircraft is discussed. The inertial navigation system tested was a Litton Model LN-3, modified to compute and display aircraft latitude and longitude. The model contains an inertial platform and an analog computer for sensing aircraft acceleration and computing latitude and longitude position. The inertial navigator-control and position-indicator units were used for turning the equipment on and off and setting it in the proper initial position and approximate aircraft heading information. The true heading and readout and the adapter unit are basically follow-up devices using the inertial gimbal angles as their references. The test equipment used consisted of a mobile test cart containing a dual-beam oscilloscope, a three-channel strip-chart recorder, a differential voltmeter, and a platform electronics interface test panel. Tests were performed during 103 flights, of which 55 were North Atlantic crossings. System performance data were collected in terms of accuracy, maintenance, reliability, and suitability for airline use. I.v.L.

N64-10157 Chance Vought Corp., Dallas, Tex. Astronautics Div.
HYPERBOLIC ENTRIES INTO THE EARTH'S ATMOSPHERE
C. P. Russell, Jr. Sept. 3, 1963 28 p
(Memo 3-50000/3M-1576)

An exploratory investigation was conducted on hyperbolic entries into the earth's atmosphere at velocities up to 70,000 ft/sec. For all entries, the 1959 Air Research and Development Command atmosphere was used, and the flight path was assumed to be easterly along the equator. Emphasis was placed on the trajectory characteristics corresponding to a $L/D_{max} = 1.3$ vehicle with angle-of-attack modulation capability (Winged Ellipsoid). Qualitative data are also presented for an "Apollo-like" vehicle. It was found that the Winged Ellipsoid could be controlled to experience considerably less acceleration than the Apollo vehicle. I.v.L.

N64-10168* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SURVEY OF ATMOSPHERE RE-ENTRY GUIDANCE AND CONTROL METHODS
Rodney C. Wingrove Repr. from AIAA J., v. 1, no. 9, Sept. 1963 p 2019–2029 refs Presented at the IAS 31st Ann. Meeting, N.Y., Jan. 21–23, 1963
(Revision of IAS Paper 63-86, previously announced as N63-12902 07-22)

The basic dynamics of entry trajectories and how the dynamics of the trajectory variables are related to the guidance and control problem are considered. The various guidance and control concepts are described in detail under two general categories: (1) guidance using predicted capabilities and (2) guidance using a nominal trajectory. Also, the application of these guidance systems to current vehicle configurations and to entries from circular, supercircular, and abort conditions is discussed. I.v.L.

N64-10177* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONTRIBUTION TO THE THEORY OF CRITICAL INCLINATION OF CLOSE EARTH SATELLITES. 2. CASE OF ASYMMETRICAL POTENTIAL
Shinko Aoki Repr. from Astronom. J., v. 68, no. 6, Aug. 1963 p 365–381 refs For Abstract see N63-19945 19-29
(NASA RP-54)

N64-10235 Deutsche Forschungsanstalt für Luft- und Raumfahrt, Brunswich (W. Germany) Inst. für Luftfahrzeugfuhrung
DIGITAL RECORDING AND HANDLING OF FLIGHT PATH DATA [DIGITALE ERFASSUNG UND BEARBEITUNG VON FLUGBAHNMESS WERTERN]
O. Weber and K.-H. Hurrass 1963 34 p refs In GERMAN Presented at the Ann. Meeting of the Wiss. Ges. Luft- und Raumfahrt, Munich, Oct. 8–12, 1963

A survey of the problem which arises in the direct pickup, for data processing, of motion picture theodolite- and radar-measurement values dealing with flight paths is presented, along with a simple installation for digital pickup and storage of radar data. It is indicated that the technical difficulties are much greater with the theodolite than with radar equipment. Possible improvements in theodolite systems are discussed. I.v.L.

N64-10310* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
EARTH-VENUS TRAJECTORIES, 1968-69, VOLUME 4, PART A
V. C. Clarke, Jr., R. Y. Roth, W. E. Bollman, T. W. Hamilton, and C. G. Pfeiffer Aug. 1, 1963 791 p refs
(NASA Contract NAS7-100)
(NASA CR-52465; JPL-TM-33-99, Vol. 4, Pt. A) OTS: $31.00 ph, $23.93 mf

The results of extensive machine computations of three-dimensional ballistic Earth–Venus trajectories for the launch date interval of November 16 to December 25, 1968, are presented in tabular form. Data include heliocentric and planetocentric conic computations, differential corrections, midcourse guidance, orbit determination, and accuracy of computations. An analytical model for interplanetary trajectories and an explanation of the trajectory tables are also included. J.E.T.

N64-10412 Federal Aviation Agency, Atlantic City, N.J. National Aviation Facilities Experimental Center
EVALUATION OF FLIGHT INSPECTION POSITIONING SYSTEM Final Report
Donald L. Fehr June 1963 61 p refs

Tests were conducted to determine the accuracy of several distance measuring systems. These systems were Tactical Air Navigation Equipment (TACAN), TACAN with a Jitter Eliminator Attachment (JEA), Nonstandard Measuring Equipment NSME), and a Radar Identification Set AN/APX-6 beacon transponder equipment modified to provide distance measurement. Tests included measurement of the distance accuracy of each of the systems by comparison with the ranging information from Multi-Object Phase Tracking and Ranging System during flight tests and laboratory measurements of the stability of the modified APX-6, TACAN, and TACAN with JEA. The mean error and standard deviation was determined for each flight test run. A composite mean and standard deviation was then computed for each system. The limits of dispersion were predicted for each

of the systems based on 0.95 probability that at least 95 percent of the cases would be included within ±2.036 standard deviations. Author

N64-10421 Radio Technical Commission for Aeronautics, Washington, D.C.
STANDARD PERFORMANCE CRITERIA FOR AUTOPILOT/COUPLER EQUIPMENT
Mar. 14, 1963 184 p refs
(RTCA 31-63/DO-118) RTCA: $2.00

Standard performance criteria are defined for airborne Autopilot/Coupler Equipment to be used in conjunction with Instrument Landing Systems (ILS) during final approach operations down to an altitude of 50 feet above the elevation of the airport runway on which a landing is to be made. Previous ILS performance requirements are amplified and supplemented, and factors such as aircraft approach speeds and angles of bank, angle of intercept and point of intercept of the Localizer course, point of Autopilot/Coupler engagement, wind conditions, and other related factors are defined. M.P.G.

N64-10619* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELIMINARY STUDY OF PERIODIC ORBITS OF INTEREST FOR MOON PROBES. II
Su-Shu Huang and Clarence Wade, Jr. Repr. from Astron. J., v. 68, no. 6, Aug. 1963 p 388-391 refs
(NASA RP-61)

Under the approximation of the restricted three-body problem, two families of periodic orbits that enclose both the earth and the moon in the plane of the earth–moon orbit have been derived, and their initial conditions tabulated. Their stability is examined by investigating the variation of the difference of two successive periods with cycles. Two sequences of initial conditions have been studied in order to find some periodic orbits in the three-dimensional case. Among those investigated, none with the desired characteristic, namely of enclosing both the earth and the moon, has been found. Author

N64-10637 Joint Publications Research Service, Washington, D.C.
INERTIAL NAVIGATION SYSTEMS, USSR
G.O. Fridlender Mar. 11, 1963 236 p refs Transl. into ENGLISH of the book "Inertsial'nyye sistemy navigatsii" Moscow, State Publ. House for Math. and Phys. Literature, 1961
(JPRS-18047; OTS-63-21291) OTS: $3.50

This report examines the principles which are the basis for inertial systems, possible errors in systems of this kind, and briefly elucidates the operation of inertial systems in a closed circuit which includes the inertial system—autopilot—winged aircraft. The problem of special features in the application of inertial systems to future controlled interplanetary flight is also investigated. C.L.W.

23 PHYSICS, GENERAL

Includes acoustics; cryogenics; and optics. For astrophysics see: 05 Astronomy and Astrophysics. For related information see: 12 Geophysics; 29 Space Sciences; 24 Physics, Plasma; and 25 Physics, Solid-State.

N64-10012 Nihon U., Tokyo (Japan)
EFFECTS OF NON-LINEAR RESPONSE OF THE ELECTRON DISTRIBUTION IN THE PHENOMENA OF RESONANCE PROBE
Yoshi H. Ichikawa [1963] 16 p refs
(NUP-63-14)

The theory of the resonance probe has been developed on a basic assumption that the primary effect in resonance phenomena is the linear response of the electron distribution in a plasma to the oscillating potential superposed on the probe. In the present paper, effects of nonlinear response of the electron distribution are examined by applying the van der Pol-Bogoliubov–Krylov expansion method. Author

N64-10013 Radiation Applications, Inc., Long Island City, N.Y.
THE DEVELOPMENT OF LARGE BETA RADIATION SOURCES AND THEIR APPLICATIONS Final Report No. 1, Jan. 1, 1959-Oct. 31, 1962
Jacques J. Weinstock, Yael Miron, and P. Murali Krishna July 1963 144 p
(Contract AT(30-1)-2186)
(RAI-202) OTS: $2.50

An extensive research and development program has produced vitreous enamel formulations suitable for the fabrication of large, planar, beta radiation sources using promethium-147, cerium-144, or strontium-90 as the active component. The physical and chemical properties of these enamels have been characterized, and actual source dosimetry patterns have been established for Pm^{147} and Ce^{144} sources. A parallel study has developed an attractive radiation-induced graft polymerization process for modifying the properties of polypropylene films and fabrics which is ideally suited for the use of large beta sources. Author

N64-10035 European Atomic Energy Community, Brussels (Belgium)
UTILISATION OF PROPORTIONAL COUNTERS CONTAINING BF_3 FOR DETECTING WEAK NEUTRON FLUXES IN THE PRESENCE OF HIGH GAMMA FLUXES [UTILISATION DES COMPTEURS PROPORTIONNELS AU BF_3 POUR LA DETECTION DE FLUX DE NEUTRONS FAIBLES EN PRESENCE DE HAUTS FLUX GAMMA]
J. Fleury Joint Nuclear Res. Center, Ispra Estab. (Italy), July 1963 50 p refs In FRENCH; ENGLISH abstract
(EUR 300.f) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 70 Belg. Fr.

The possibility of discriminating between low neutron fluxes from 0.1 up to 10 n/cm^2/sec with proportional BF_3 counters has been studied. The best solution consists of reducing the effect of gamma pile-up with a special electronic device which includes, in the linear amplifier, a double RC differentiation which is as short as possible. Some theoretical considerations determine the minimum differentiation to be used, when the noise level of the preamplifier, and the fluctuations of the pulse shape due to the variable collection times of the primary electrons on the counter wire are known. Good agreement has been found between theory and experiment. Author

N64-10071 Grumman Aircraft Engineering Corp., Bethpage, N.Y. Research Dept.
PHASE DISTORTION OF REFLECTED SINE WAVE ACOUSTIC PULSES
Walter Abramowitz Jan. 1963 15 p refs
(RN-152)

The phase distortion of an acoustic pulse reflected at the interface of two fluid media is determined theoretically. The incident pulse is one cycle of a sine wave. A plot of the reflected pulse is presented for a number of phase shifts.

Author

N64-10075* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

SEMIAUTOMATIC MODULUS OF RUPTURE TESTER FOR OPERATION IN VACUUM OR INERT ATMOSPHERES

Alan Arias Repr. from Rev. Sci. Instr., v. 34, no. 8, Aug. 1963 p 911-914

(NASA RP-50)

The construction and operation of a semiautomatic modulus of rupture tester for determining the modulus of rupture up to 2400° C in either vacuum or inert atmospheres are described. One of the unique features of the apparatus is its ability to test up to 18 specimens without being reloaded. This paper includes a description of the auxiliary equipment used in conjunction with the tester, and a typical curve of modulus of rupture against temperature obtained with this tester.

Author

N64-10076 General Dynamics/Astronautics, San Diego, Calif.

A GENERAL APPROXIMATE METHOD OF ANALYSIS OF THIN SHELLS

K. C. Valanis Aug. 30, 1963 35 p refs

(GD/A 63-0761)

A general approximate numerical method for the stress analysis of thin shells of arbitrary geometric configurations is presented. The method is formulated in matrix notation and is of the displacement or direct-stiffness type, as the deformations are calculated prior to the derivation of the stress and strain distributions.

Author

N64-10084* Space Technology Lab., Inc., Redondo Beach, Calif.

CHARGED PARTICLE RADIATION DAMAGE IN SEMICONDUCTORS, VII: ENERGY LEVELS OF DEFECT CENTERS IN ELECTRON AND PROTON BOMBARDED SILICON

J. R. Carter and R. G. Downing Feb. 15, 1963 26 p refs

(NASA Contract NAS5-1851)

(NASA CR-51528; MR-30; Rept. 8653-6021-KU-000) OTS: $2.60 ph, $0.98 mf

Bound energy levels resulting from proton and electron bombardment of silicon have been investigated through measurements of the temperature dependence of the Hall coefficient and Hall mobility. Three energy levels are found; these are located at 0.17 ±0.01 ev and 0.40 ±0.03 ev below the conduction band in n-type silicon, and 0.29 ±0.02 ev above the valence band in p-type silicon. Defect introduction rates have been measured for each of these levels as a function of particle type and particle energy. Protons are found to yield an introduction rate about 100 times greater than electrons in qualitative agreement with earlier lifetime studies. However, it is concluded that the recombination centers which control minority carrier lifetime may not be related to the bound energy levels which control the Hall coefficient and the majority carrier concentration.

Author

N64-10107* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A STUDY OF THE DISTRIBUTION OF MOLECULES UNDER FREE MOLECULAR FLOW CONDITIONS AFTER COLLISIONS WITH SIMPLE GEOMETRIES

David W. Tarbell and James O. Ballance May 28, 1963 121 p refs

(NASA TM X-51032; MTP-AERO-63-43) OTS: $10.10 ph, $3.83 mf

The study makes a detailed examination of molecular distribution under free molecular flow conditions within surfaces of simple geometries. By considering infinite length in one dimension, the problem could be reduced to a two-dimensional analysis. Exact, closed-formed solutions were obtained only for circles; however, numerical solutions were obtained for ellipses and parabolas. Monte Carlo computer technique results were obtained and compared to the theretical solutions. Derivations of the distribution of molecules over the surface as a function of collision number, the exit distribution across the opening of each surface configuration, and the distribution across the center line of each configuration are presented.

Author

N64-10125 Atomic Energy Establishment, Bombay (India) Health Physics Div.

AIRBORNE CERIUM-141 AND CERIUM-144 AT BOMBAY DURING NOVEMBER, 1961-FEBRUARY 1963

L. U. Joshi and K. G. Vohra 1963 19 p refs

(AEET/AM/36)

Higher levels of cerium-141 were observed in June 1962 and during October 1962 to February 1963, while high cerium-144 levels were observed from December 1961 to April 1962 and during January and February 1963. A sharp increase in the ratio of cerium-141 to cerium-144 was observed in June, August, October, and December 1962 indicating the arrival of fresh radioactive debris in the atmosphere from the tests carried out during 1962. This report gives the method of sampling, chemical procedures, and the data on the levels of cerium-141 and cerium-144 in the ground-level air.

Author

N64-10129 Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.

LAS VEGAS AREA (ARMS-II)

R. B. Guillou, J. E. Hand, and H. M. Borella AEC, Civil Effects Test Operations, July 10, 1963 23 p refs

(CEX-61.6.1) OTS: $0.50

An Aerial Radiological Measuring Survey (ARMS) was made of the Las Vegas area. The survey was part of a nationwide program to measure present environmental levels of gamma radiation. Maximum readings in most of the north half of the area are below 400 counts/sec; in only one sizable area are they above 800 counts/sec. The south half of the area, which is much more radioactive, can be divided into three sections: (1) a west section, where the maximum count rate is usually below 800 counts/sec; (2) a center section, where the maximum count rate is less than 4000 counts/sec in half the section and less than 1200 counts/sec in the other half; and (3) a heterogeneous east section, where less than 1200 counts/sec predominates but where there are sizable higher areas. The general distribution of radioactivity can be directly attributed to the geology of the area. Carbonate and clastic rocks usually are associated with low aeroradioactivity levels; metamorphic, intrusive, and volcanic rocks generally give rise to moderate to high aeroradioactivity levels.

Author

N64-10149 India. Dept. of Atomic Energy, Bombay

THE SPECTROGRAPHIC ANALYSIS OF URANIUM FOR SIXTEEN TRACE IMPURITIES BY THE CARRIER DISTILLATION METHOD

R. K. Dhumwad, M. N. Dixit, G. Krishnamurthy, B. N. Srinivasan, and B. R. Vengsarkar Atomic Energy Estab., Trombay, Anal. Div., 1963 23 p refs

The carrier distillation method for the analysis of nuclear-purity uranium and its compounds has been standardized by using silver-chloride and gallium as carrier and internal standard element, respectively. Sixteen elements can be analyzed simultaneously by giving two different exposures for each pair of the standard and the sample. Only one set of standards incorporating all the sixteen impurity elements has been used. The mean standard deviation of the intensity ratios for the original working curves (based on ten values for each standard of the various elements, from only two plates) varies between 8 and 15. Author

N64-10150 Boeing Scientific Research Labs., Seattle, Wash.
TRAPPED RADIATION AND IONOSPHERIC PERTURBATIONS DUE TO AN IMPULSIVE NEUTRON SOURCE
James F. Kenney and H. R. Willard Apr. 1963 87 p refs
(DI-82-0241)

Computations based on a neutron decay model have been carried out to evaluate the contribution of the decay products of neutrons emitted from a fission reaction to associated ionospheric disturbances and trapped radiation increases. It is shown that the fission neutron source is useful in explaining the morphology of nuclear-associated VLF effects, although the amount of ionization produced promptly in the D-region may be insufficient to account for the magnitude of these effects. Experimental evidence is also advanced to show the detection of short-lived trapped radiation from this neutron decay source. The contribution to the long-lived trapped radiation is shown to be negligible. Author

N64-10151 Babcock and Wilcox Co., Lynchburg, Va. Nuclear Development Div.
SPECTRAL SHIFT CONTROL REACTOR BASIC PHYSICS PROGRAM. MEASUREMENT AND ANALYSIS OF PERTURBED LATTICES OF SLIGHTLY ENRICHED UO_2 MODERATED BY D_2O-H_2O MIXTURES
T. C. Engelder, R. H. Clark, E. J. De Roche, G. T. Fairburn, and J. W. Hallam et al Oct. 1963 99 p refs
(Contract AT(30-1)-2602)
(BAW-1274 CA-7) OTS: $2.25

Perturbers were introduced axially by removing fuel pins to create moderator gaps and by inserting perturbing blades and cruciform rods. The materials were Boral, cadmium, or aluminum. Most perturbers were fully inserted, but some measurements were made while the Boral cruciform rod was 1/3 and 2/3 withdrawn. Thermal flux distributions were measured with gold and dysprosium foils. Reactivity was determined by using $\partial\rho/\partial h$ techniques and by measuring the differential boron worth and the boron concentration required for criticality at the reference moderator height. Reactivity and thermal neutron flux shapes were calculated using (1) PDQ-4, a four-group, two-dimensional neutron diffusion code for the Philco 2000 computer, and (2) TKO, a four-group, three-dimensional code for the IBM-704 computer. Author

N64-10158 Weather Bureau, Oak Ridge, Tenn.
DEPOSITION AND WASHOUT COMPUTATIONS BASED ON THE GENERALIZED GAUSSIAN PLUME MODEL
Walter M. Culkowski AEC, Div. of Tech. Inform., Sept. 30, 1963 28 p refs
(ORO-599) OTS: $0.50ph

In order to provide a complete set of graphical aids to the computation of dispersion, it is desirable to take into account not only concentration and area dosages, but also deposition and washout. The treatment of these is based on the same generalized Gaussian dispersion model that has been described previously. The use of empirically derived dispersion coefficients appears to be a step toward more realistic description and evaluation of meteorological conditions. The maximum rates of washout and surface deposition possible for any given release are established. These rates of deposition depend largely on the meteorological parameters of precipitation, cloudiness, and wind speed, which are elements of record in every climatological summary. Author

N64-10187 Los Alamos Scientific Lab., N. Mex.
QUARTERLY STATUS REPORT ON LAMPRE PROGRAM FOR PERIOD ENDING AUGUST 20, 1963
Sept. 26, 1963 19 p
(Contract W-7405-eng-36)
(LAMS-2973) OTS: $0.50

LAMPRE I (Core II) accumulated an additional 8.4 Mwd of operation to give a total integrated power of 194.5 Mwd. During run no. 73, which started on May 15, 1963, two instances of abnormal buildup of gamma activity in the cover gas system was observed, accompanied by a total loss of reactivity of 10¢ to 26¢. Other activities and observations discussed in this report include: (1) metallographic and X-ray examination of fuel capsules from Core II; (2) evaluation and fabrication of tantalum fuel containers; (3) heat testing of plutonium–cobalt-cerium fuels; testing of cobalt–cerium fuels with carburized and uncarburized tantalum; melting temperatures of other cerium-based alloys; (4) studies of plutonium–scandium plutonium–lanthanum, and plutonium–praseodymium alloys; and (5) discussion of reactor calculations and the core test facility. P.V.E.

N64-10192 Rochester U., N.Y.
A STUDY OF THE (He^3, n) REACTION ON C^{12} AND C^{13}
V. K. Deshpande, H. W. Fulbright, and J. W. Verba Oct. 1, 1963 21 p refs Submitted for Publication
(Contract AT(30-1)-875)
(URPA-7)

Angular distributions and excitation curves are presented for the $C^{12}(He^3,n)O^{14}$ (ground state) reaction for bombarding energies between 5.5 and 11 Mev and for the $C^{13}(He^3,n)O^{15}$ (ground state) reaction for bombarding energies between 7.5 and 11 Mev. The angular distributions in both cases have peaks at 0°. They are analyzed in terms of Newns' double stripping theory. In the case of C^{12}, the 0° cross section shows a large variation with energy, whereas in the case of C^{13}, the excitation curve is relatively flat. Results are compared with the available data from corresponding (He^3,p) reactions. Author

N64-10193 Comision Nacional de Energia Atomica, Buenos Aires (Argentina)
SOME (d,α) REACTIONS ON Be^9, F^{19} and Al^{27} AT 27.5 Mev
S. Mayo, J. Testoni, and O. M. Bilaniuk Rochester U., N.Y., Sept. 27, 1963 18 p refs Submitted for Publication
(URPA-10)

The angular distributions of absolute cross sections were measured for (d,α) reactions at 27.5 Mev leading to the following final states: 4.63 and 7.47 Mev in Li^7; ground and 0.872 Mev in O^{17}; ground, 1.61 and 3.399 plus 3.408 Mev in Mg^{25}. Measurements were carried out in the angular range from 15 to 120 lab. degrees, in 5-degree intervals for the forward, and 10-degree intervals for the backward hemisphere. A solid-state detecting system with a resolution in energy of about 1% was used. The angular distributions show pronounced

forward peaking. Comparison is made with cross sections computed, in plane wave Born approximation, for double pick-up and knockout mechanisms. Author

N64-10210 Oak Ridge National Lab., Tenn. Nuclear Safety Information Center
EFFECT OF PARTICLE AGGLOMERATION ON THE PENETRATION OF FILTERS UTILIZED WITH DOUBLE CONTAINMENT SYSTEMS
M. H. Fontana and W. E. Browning, Jr. Sept. 25, 1963 22 p refs
(ORNL-NSIC-1)

The penetration of filter systems in dual containment systems by fission products adsorbed on particulate matter was studied theoretically. A simplified model was analyzed in which the particulate matter was assumed to be pure iodine, and all particulates having diameters less than 0.3μ were assumed to penetrate the filters. It was shown that agglomeration would occur rapidly enough so that the particles, even though initially much smaller, would reach a 0.3μ size in a short time (<20 min for typical water-reactor systems). This time is directly proportional to the containment volume and inversely proportional to the power level. Assuming that the filter efficiency of the secondary containment sweep gas filtration system is zero for particles less than 0.3μ, the fraction of the core activity released to the atmosphere during that time was calculated for some conditions of interest. For one reactor system treated, less than 10^{-5} of the iodine available would be released. Author

N64-10230 India. Dept. of Atomic Energy, Bombay
A GRAPHICAL METHOD OF GAMMA RAY SHIELDING CALCULATIONS
C. M. Sunta Atomic Energy Estab., Trombay, Health Physics Div., 1963 26 p refs

A graphical technique is presented for calculating the shield thickness required to keep the gamma radiation exposure of personnel below the permissible dose limits. The method is a general one which may be used for any shielding material whose attenuation properties are known for gamma rays of different photon energies of practical interest. However, the method can be applied only to cases where point source geometry can be used. Tables and graphs of necessary data for important gamma shielding materials are presented, and the correction for dose build-up is included. Sample calculations to illustrate the procedure are given. M.P.G.

N64-10231 India. Dept. of Atomic Energy, Bombay
EMISSION OF PROMPT GAMMA-RAYS IN THERMAL NEUTRON FISSION OF U-235
S. S. Kapoor and R. Ramanna Atomic Energy Estab., Trombay, Nuclear Physics Div., 1963 35 p refs
(AEET/NP/7)

The angular distributions of prompt fission gamma rays with respect to the direction of selected fission fragments in the thermal neutron fission of U^{235} have been studied for two different gamma energy groups using a gridded ionization chamber–scintillation detector assembly. The ionization chamber has been used to measure the fragment kinetic energies and the angles of their tracks with respect to the flight direction of the gamma rays detected by a plastic scintillator placed along the electric field direction of the chamber. These measurements definitely show the existence of a significant anistropy of emission of the gamma rays in the emitting fragment system after making allowance for the motion of the fragments. The anisotropy of emission is explained as arising due to the polarized angular momenta of the fission fragments, which also lead to an enhancement of gamma ray emission. The emission of the gamma rays from the rotating fragments is discussed with respect to the observed number and the spectrum of the gamma rays. Author

N64-10237* Stanford Research Inst., Menlo Park, Calif.
THREE-PARTICLE SCATTERING. I. PLANAR CASE
R. C. Whitten Repr. from J. Math. Phys., v. 4, no. 5, May 1963 p 622-633 refs
(NASA Contract NASr-49(07))
(NASA CR-52223)

A formal theory of three-particle scattering in a plane is developed using integral equation methods. Expressions for the scattering amplitude and cross section of elastic and inelastic collisions are derived. The effects of indistinguishability of the colliding particles are discussed. Author

N64-10238 Gt. Brit. Ministry of Aviation, London Technical Information and Library Services
A STUDY OF SOME MICHAEL REACTIONS USING THE MOLECULAR ORBITAL THEORY
Y. Oda and T. Shono Aug. 1963 13 p refs Transl. into ENGLISH from Nippon Kagaku Zasshi, v. 78, no. 11, 1957 p 138–144
(TIL/T-5226)

A study is made of the relationship between the reactivity and structure of chain pseudoacids undergoing the Michael reaction. A relationship was found between the equilibrium dissociation constants in aqueous solution and the structure of the pseudoacid. The relative value of the dissociation constants was closely determined by the relative change in the π electron energy. No additive property in the effect of the substituents was present. Author

N64-10251 Automation Industries, Inc., Boulder, Colo.
APPLIED RESEARCH TO ESTABLISH INFRARED DETECTION METHODS FOR NONDESTRUCTIVE ANALYSIS OF METALLIC AND CERAMIC STRUCTURES
Dale R. Maley Wright-Patterson AFB, Ohio, Directorate of Mater. and Processes, Jan. 1963 93 p refs
(Contract AF 33(616)-7725)
(ASD-TDR-62-385; AD-299230)

A thermal testing system was conceived and developed with which certain fabricated material inconsistencies have been detected in standard test samples. The system operation is basically a programed heating with subsequent temperature measurement over one surface of the test sample. Temperature is measured with an infrared detection system. A display of the temperature pattern over the surface is then interpreted with respect to internal material inconsistencies. Inconsistencies detected to date include voids, delamination (areas of unbonding), and metallic inclusion. Author

N64-10252 European Atomic Energy Community, Brussels (Belgium)
LATTICE VIBRATIONAL SPECTRUM OF VANADIUM
K. Krebs Joint Nuclear Res. Center, Ispra Establishment (Italy) 1963 23 p refs
(EUR-366.e) Available from Belgian American Bank and Trust Co., account No. 121.86: 40 Belg. Fr.

The lattice vibrational spectrum of vanadium is calculated on the basis of four different force models. The comparison with a spectrum measured by neutron techniques shows that none of these "standard" models is completely satisfactory. Author

N64-10259 Atomic Energy of Canada Ltd., Chalk River, Ontario
CRACKING AND BULK MOVEMENT IN IRRADIATED URANIUM OXIDE FUEL ELEMENTS
A. S. Bain Sept. 1963 42 p refs Presented at the meeting of the Am. Nucl. Soc., N.Y., Nov. 1963
(AECL-1827; CRFD-1156)

UO_2 pellets were fabricated with simulated circumferential or diametral cracks, and with voids formed by drilling axial or radial holes. Under irradiation, the cracks healed in a region extending out slightly beyond the area of discernible grain growth. Cracks in the cooler outer annulus formed early and remained during the irradiation. Similarly, voids in the outer annulus were unchanged, whereas those in the grain-growth region closed. Tungsten wire markers stayed in their original positions, demonstrating that the surrounding columnar grains in the UO_2 had not formed during the solidification of a melt. Decreases in diameter of 1 mm thick Zircaloy-2 sheathing assembled with large fuel/sheath diametral clearances were due to multiaxial stresses arising from axial elongation and the lack of diametral restraint. Author

N64-10272 Stanford Research Inst., Menlo Park, Calif. Poulter Labs.
CONTAINMENT OF FRAGMENTS FROM A RUNAWAY REACTOR Technical Report No. 6
R. W. White and N. B. Botsford Sept. 15, 1963 36 p refs
(Contract AT(04-3)-115)
(SRIA-113) OTS: $0.75

The possibility that the outer vapor-containment shell of a reactor might be bombarded by fragments from a ruptured internal structure prompted studies of the penetration of mild steel plates by cylindrical steel rods. A semiempirical formula describing the results of small-scale experiments was derived previously. The results of experiments investigating the effect of scale size and prestress of the target are reported. Linear scaling of the formula was found to be valid, at least to a first approximation, over a range of variation in scale size of seven to one. A linear relationship was found between increase of target prestress and reduction of penetration resistance. In addition, experiments with concrete projectiles containing iron-shot aggregates showed that these required greater energy for penetration than ordinary concrete projectiles. M.P.G.

N64-10274 College of Aeronautics, Cranfield (Gt. Brit.)
OPTIMUM MICHELL FRAMEWORKS FOR THREE PARALLEL FORCES
H. S. Y. Chan Aug. 1963 27 p refs
(CoA-167)

So far only strictly symmetrical cases have been considered. It is the intention of the present paper to apply the general theory of optimum design to a rather complicated problem of this type, and study in full detail the outcoming mathematical concepts, both numerical and theoretical. Author

N64-10295* California U., Livermore Lawrence Radiation Lab.
ELECTRONS FROM BOMB NEUTRON DECAY
John Killeen, Wilmot N. Hess, (NASA, Goddard Space Flight Center), and Richard E. Lingenfelter (California U., Los Angeles) [1963] 21 p refs
(NASA TM X-51055) OTS: $2.60 ph, $0.83 mf

Using, as an example, a nuclear explosion above the earth's atmosphere, the trapped electron flux resulting from the decay of neutrons emanating from a point source is calculated. Sources, both off and on the magnetic equator, are considered along with both neutrons emanating directly from the source as well as albedo from the top of the atmosphere. For a source on the magnetic equator, the electron flux along a field line N would be:

$$N(\theta_o,\theta) = B(\theta_o,\theta)\int_{\theta}^{\theta_o} \frac{W(\theta_o,\theta_t)\ d\mathrm{l}_t}{B(\theta_o,\theta_t)\sqrt{T(\theta_o,\theta_t)}\sqrt{1 - B(\theta_o,\theta)/B(\theta_o,\theta_t)}}$$

where $W(\theta_o,\theta)$ is the distribution of mirror points of the electrons. For normally incident neutrons, the albedo was calculated to be 0.74 for 1-kev neutrons and 0.63 for fission neutrons. Both values increase to unity with decreasing angle-of-incidence. Integration of these two functions over the cosine of the angle-of-incidence gives a total albedo of 0.80 for neutrons with a Maxwellian distribution at 1 Kev, leaving the explosion site in the downward hemisphere, and 0.73 for similar neutrons with a fission spectrum. P.V.E

N64-10299 Tokyo U. (Japan) Inst. of Industrial Science
ON THE STUDY OF THE IMAGE OF PHOTOGRAPHIC LENS BY MEANS OF SPOT DIAGRAM
Hiroshi Kubota and Kenro Miyamoto Aug. 1963 65 p refs
(*Its* Serial 89, v. 13, no. 2)

In order to measure the performance of a lens objectively, the optical transfer functions of actual lenses are calculated from their spot diagrams by using an electronic computer. Two kinds of lenses are treated as examples. One is the Sonnar-type lens, the data of which are unknown. The other is the Gauss-type lens, whose data are known. The spot diagrams of the former lens are obtained from the curve of spherical aberration which is measured experimentally and approximated by the 7-th order polynomials. The coordinates of spot diagrams of the latter one are calculated by ray tracing using the known data of lens. The optical transfer functions of two lenses are calculated from these spot diagrams, and the agreement with the measured values is satisfactory. Author

N64-10303* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
ANALYSIS OF PROTON-ALPHA SCATTERING
C. C. Giamati, V. A. Madsen, and R. M. Thaler Repr. from Phys. Rev. Letters, v. 2, no. 4, Aug. 15, 1963 p 163–165 refs

A phase-shift analysis was made from detailed elastic scattering data at 39.8 Mev and equally detailed polarization data at very nearly the same energy. The analysis was made using the GT(Gammel and Thaler) phase shifts as a starting point. The phase shifts obtained as well as the GT phase shifts are presented in tabular form, and the fit to the polarization data is graphically presented. Although the predicted polarizations are very different, the two sets of phase shifts do not greatly differ. In the course of the analysis, it was found that no fit was possible unless angular momentum states with $\ell \leq 4$ were included. It was also found that the fit was not improved by allowing the phase shift to be complex. I.v.L

N64-10307* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
USE OF POLAROID FILM IN X-RAY DIFFRACTION
A. E. Spakowski Repr. from Rev. Sci. Instr., v. 34, no. 8, Aug. 1963 p 930–931 refs

A Polaroid X-ray diffraction camera is described. This camera has been used almost exclusively to determine the orientation of single-crystal films and substrates and to align crystals for precise cutting. Acceptable pictures can be obtained for exposures of about 0.5 min. The principal attraction of this camera lies in its 10-sec development time, which saves 30

to 45 min over the usual negative-processing time. The quality of the diffraction patterns obtained, with a relatively coarse-grained Polaroid film, is satisfactory for most orientation work, and the accuracy is well within the 1° generally associated with the routine Laue technique. I.v.L.

N64-10311 Nihon U., Tokyo (Japan) Atomic Energy Research Inst.
ON THE CORRELATION OF RESONANCE AND INELASTIC THRESHOLD INVOLVING UNSTABLE PARTICLES
Yasunori Fujii [1963] 35 p refs
(NUP-63-13)

The nature of the resonances occurring close to the thresholds of inelastic channels involving unstable particles is investigated with particular attention to the widths. It is concluded that the width of a peak must be larger than a lower limit of order of the sum of the widths of the unstable particles involved. The correspondence of $N^*_{\frac{3}{3}}$ (1517 Mev, I = 1/2) and Y^*_{03} (1520 Mev, I = 0) to the thresholds of $N\rho$ and $Y^*_{\frac{1}{3}}$ (1385 Mev, I = 1)π, respectively, are found not to satisfy this condition. On the other hand, a reasonable correspondence seems possible between $Y^*_{\frac{1}{3}}$ (1600 Mev, I = 1) and Y^*_{03} π threshold. Author

N64-10314 General Electric Co., Philadelphia, Pa. Space Sciences Lab.
THE EFFECT OF COLLISION SIZE ON THE BOLTZMANN EQUATION
F. W. Mezger Oct. 1963 27 p
(R63SD87)

The possibility of generalizing the Master Equation and the Boltzmann collision integral to include the fact that collisions have a finite extent in space and time is discussed. By modifying the Strosszahlansatz (collision probability postulate) to include a time delay, a generalization of the usual Master Equation is obtained. Consideration of the geometry of finite-size collisions leads to generalizations of the Boltzmann collision integral. The collision integral generalization results from a heuristic combining of particle trajectory and collision models within the confines of discussing transport phenomena in terms of binary collisions and a single particle distribution function, and in no sense replaces the rigorous treatments based on multiparticle distribution functions and the Liouville equation. Author

N64-10342* Electro-Optical Systems, Inc., Pasadena, Calif.
A STEADY STATE HALL CURRENT ACCELERATOR Second Quarterly Progress Report, Aug. 17, 1962-Nov. 16, 1962
G. L. Cann, G. L. Marlotte, and R. W. Ziemer Dec. 14, 1962 43 p refs
(NASA Contract NAS3-2500)
(NASA CR-52448; EOS 3160-Q-2) OTS: $4.60 ph, $1.49 mf

In order to obtain a clear picture of the energy and momentum transfer processes that occur in a Hall current accelerator, the equations describing the electron and ion motion were studied separately. A gasdynamic investigation was made of the thrust efficiency of the accelerator. In order to improve the performance of the accelerator, a hot hollow cathode tube was designed, fabricated, and tested, but results indicate that modifications need to be made in order to improve the uniformity of current density over the surface area; however, the introduction of a center body, forming an annulus for the gas to flow in did improve the performance. The results obtained, when using both an insulated copper and an insulated iron center body, are reported. R.T.K.

N64-10365 Bettis Atomic Power Lab., Pittsburgh, Pa.
THE EMANATION OF RADON-220 FROM SINTERED UO_2 POWDERS AND PLATES
J. C. Clayton and S. Aronson Oct. 1963 30 p refs
(Contract AT(11-1)-GEN-14)
(WAPD-276) OTS: $0.75

The uranium oxide samples were indexed with radiothorium by coprecipitation and coevaporation techniques. The emanation measurements were performed in a flow system, using an alpha scintillation detector and a helium–hydrogen carrier gas mixture. Both the radiothorium concentration (5 to 100 $\mu c/g$ UO_2) and the uranium oxide density (71 to 99 percent TD) were varied. Assuming a diffusion mechanism, diffusion coefficients for thoron in sintered UO_2 were calculated as a function of temperature. The data were represented by an equation of the form, $D = D_o \exp(-Q/RT)$. An apparent increase in both activation energy (Q) and D_o with density was observed for the 1100° to 1450° C temperature range. For some samples the thoron emanating power could be measured at temperatures as low as 400° C. Log D versus 1/T plots from 400° to 1450° C gave intersecting straight lines with different activation energies. One intersection occurred near the Tammann temperature. The emanation of Rn^{220} from UO_2 apparently involves several types of diffusion processes. Author

N64-10422* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ATMOSPHERIC EFFECTS ON SONIC-BOOM PRESSURE SIGNATURES
Domenic J. Maglieri and Tony L. Parrott Repr. from SOUND, v. 2, no. 4, July–Aug. 1963 p 11–14 refs
(NASA RP-79)

Sonic-boom ground-pressure signatures (i.e., the shapes of the pressure variation at the ground due to the boom) were obtained for a wide variety of temperatures and wind profiles in the lower atmosphere. The results indicate a strong correlation between the peak overpressure and the type of signature measured, and the existing temperature profile in the lower atmosphere. Consistent N wave types of signatures and peak overpressure values were measured when the atmosphere was quiescent, whereas relatively large variations occurred when the lower atmosphere was judged unstable. The gross shapes and locations of the wavefront ground-intersection patterns compare fairly well with calculations, although some local variations or ripples were observed. I.v.L.

N64-10443* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
TWO-ELECTRON, ONE- AND TWO-CENTER INTEGRALS
Murray Geller Repr. from J. Chem. Phys., v. 39, no. 3, p 853–854 Aug. 1, 1963 refs
(NASA Contract NAS7-100)
(NASA CR-52462; TR-32-408)

The Fourier convolution theorem method for the evaluation of one-electron, two-center integrals was applied to the evaluation of two-electron, two-center integrals of the type $I = \int f(r_{a1}) g(r_{b2}) h(r_{12}) dr_1 dr_2$. This method does not involve the introduction of the delta-function terms and is not limited to one-center nor to specific forms for the *f*, *g* and h functions. I.v.L.

N64-10445 International Atomic Energy Agency, Vienna (Austria)
NUCLEAR FISSION: PROCEEDINGS OF THE CONFERENCE ON PLASMA PHYSICS, AND CONTROLLED NUCLEAR FUSION RESEARCH, 4-9, SEPTEMBER 1961, SALZBURG, AUSTRIA, 1962 SUPPLEMENT, PART 3

J. G. Beckerleg et al 1963 470 p refs Papers in original language (English, French, Russian, or Spanish); abstracts in each of the 4 languages
Available from Natl. Agency of Intern. Publication, Inc., or from U. N. Headquarters, New York, N.Y.: $10.00

This volume is a quarterly international scientific journal published by the International Atomic Energy Agency. The journal contains reports of original work and reviews concerning plasma physics and controlled thermonuclear fusion research, with the objective of attaining a practical energy source. The publication of the conference proceedings is intended to promote international cooperation and accelerate progress in this area. R.T.K.

N64-10464 European Atomic Energy Community, Brussels (Belgium)
CURRENT ACROSS THE LATERAL SURFACE OF A UNIFORMLY EMITTING AND SELF-ABSORBENT CYLINDER [COURANT A TRAVERS LA SURFACE LATERALE D'UN CYLINDRE UNIFORMEMENT EMETTEUR ET AUTO-ABORBANT]
U. Canali, R. Nicks, and C. Pleinevaux Joint Nuclear Res Center, Ispra Estab. (Italy) July 1633 40 p refs In FRENCH: English summary
(EUR-205.f)
Available from Belgian American Bank and Trust Co., N.Y., account no. 121.86: 50 Belg. Fr.

The expression of the particle current crossing the boundary surface of an infinite circular cylinder has been obtained as a rapidly converging series, and evaluated as a function of the linear absorption coefficient. The error made by substituting the cylinder current for the current at the center of a hemisphere whose radius equals the diameter of the cylinder never exceeds 6%. As an approximation for the finite cylinder, the intersection of the cylinder by a spheric surface has been considered. The current due to this solid has been evaluated, as well as the upper limits for the errors made. Author

N64-10471 Battelle Memorial Inst., Columbus, Ohio
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING AUGUST, 1963
Russell W. Dayton and Ronald F. Dickerson Sept. 1, 1963 82 p refs
(Contract W-7405-eng-92)
(BMI-1644(Del.)) OTS: $2.00

Progress relating to civilian applications is reported in the following areas: (1) reactor materials and components; (2) fuel studies; (3) general fuel-element development; (4) radioisotope and radiation applications (i.e., graft polymerization and formation of organo-tin compounds); (5) the development of a tracer system for in-place filter evaluation; (6) the thermal conductivity and electrical conductivity of UO_2; (7) coated-particle fuel materials; (8) corrosion studies of the fluoride-volatility process; (9) long-term creep-rupture program on SAP alloys; (10) the determination of the mechanical properties of zirconium alloys; (11) UO_2-ZrO_2 studies; (12) the postirradiation examination of Hastelloy X cladding from the AGN 1B-8T-1 subassembly; (13) the measurement of the specific heat of Zircaloy-2 and low-nickel Zircaloy-2; and (14) the rejoining of the regenerative cell components. I.v.L.

N64-10494 Joint Publications Research Service, Washington, D.C.
INTERACTION OF ELECTRONS AND POSITRONS AT HIGH ENERGIES
V. N. Bayyer Mar. 7, 1963 90 p refs Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 78, no. 4, Dec. 1962 p 615-652
(JPRS-17999; OTS-63-21268) OTS: $2.25

Study of the interaction of electrons and positrons at high energies through the collision of accelerated beams of electrons and positrons is presented. The following topics are discussed: (1) plan of experiments on meeting beams, (2) checking the applicability of quantum electrodynamics for small distances, (3) the production of particles in electron–positron collisions and the investigation of their structure, and (4) investigation of weak interactions in tests on meeting beams. P.V.E.

N64-10525 Aerojet-General Nucleonics, San Ramon, Calif.
ARMY GAS-COOLED REACTOR SYSTEMS PROGRAM: GAS-COOLED REACTOR EXPERIMENT – I Final Summary Report
R. H. Chesworth Oct. 1963 196 p refs
(Contract AT(10-1)-880)
(IDO-28598) OTS: $3.00

The mission of the GCRE-I was the generation of neutronic and engineering data in support of the design and development of a nuclear energy source for a demonstration low-power gas-cooled, water-moderated powerplant. The GCRE reactor was a heterogeneous, fully-enriched uranium-fueled unit operated in a pool of demineralized water which served as the moderator and primary radiological shield. Fuel elements were contained in a tube bundle, or calandria, which separated the fuel from the water moderator and provided passages for the gas coolant. The report includes a description of the facility and the test reactor, a full account of the conduct and results of the experimental program, and a discussion of the operating organization and philosophy. Author

N64-10538 Grumman Aircraft Engineering Corp., Bethpage, N.Y.
SOUND SCATTERING OF A STEADY STATE PLANE WAVE BY A HOLLOW CYLINDER OF ARBITRARY THICKNESS Technical Report No. 4
Hyman Garnet and Robert Kayel Sept. 1963 80 p refs
(Contract Nonr-3465(00)FBM)
(RM-223)

The present investigation was undertaken to gain insight into the problem of detecting a deep-diving submarine by acoustic means. Because of the greater structural strength requirements of a deep-diving submarine, the structural model representing the scatterer in this report is a hollow cylinder of arbitrary thickness. Thus, an opportunity to study the influence of the wall thickness on the scattered field is provided. The scattered wave in the fluid field is obtained from the equations of the theory of elasticity. It was found that the wall thickness of the cylinder exerts a significant influence on the scattered plane waves. Author

N64-10556 Brown U., Providence, R.I.
AN ABSTRACT VARIATIONAL PRINCIPLE WITH APPLICATIONS IN MATHEMATICAL PHYSICS
M. E. Gurtin Sept. 1963 14 p refs
(Contract Nonr-562(25))
(ONR-064-431; TR-23; AD-421737)

An abstract variational principle appropriate to a wide class of linear problems is established. This principle yields, as special cases, the usual variational principles of mathematical physics and, in addition, may be used to deduce many new results. For the purpose of illustration, the variational form of Dirichlet's principle is recovered, and apparently new variational principles for the initial-value problems associated with the wave and heat-conduction equations are derived. C.L.H.

N64-10571 Joint Publications Research Service, Washington, D.C.
THE "NEGATIVE" CONCENTRATION EFFECT IN THERMAL DIFFUSION OF GASES IN POROUS MEDIA
B. N. Goshchitsky and I. S. Izrailevich Mar. 18, 1963 8 p refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR, Moscow, v. 147, no. 4, 1962 p 817–818
(JPRS-18180; OTS-63-21343) OTS: $0.50

The separation effect, which occurs upon the passage of the gaseous mixtures, H_2-Ar, H_2-Kr and He-Kr, through a porous medium (barium ferrite) in the presence of a temperature gradient, was investigated. The separation effect for all of the developed pressure regions was found to be positive. This indicates that the "negative" effect, which had been reported by Beckey and Groth, was caused by parasitic feedback temperature drops in the experimental equipment used. However, the possibility must not be excluded that a partial "negative" effect may be linked to a movement of gaseous mixtures which is peculiar to long capillaries. I.v.L.

N64-10578 Joint Publications Research Service, Washington, D.C.
POSSIBILITY OF LOWERING THE INJECTION ENERGY IN ACCELERATORS AT SUPER-HIGH ENERGIES
A. A. Vasil'yev Apr. 16, 1963 9 p refs Transl. into ENGLISH from Doklady Akad. Nauk, SSSR, Tekhn. Fiz. (Moscow), v. 148, no. 3, 1963 p 577–580
(JPRS-18-723; OTS-63-21583) OTS: $0.50

A linear approximation by the differential equation

$$\frac{d^2X}{d\eta^2} - k_x(\eta)\,X = 0, \quad \frac{d^2Z}{d\eta^2} + k_z(\eta)Z = 0,$$

is used to describe the radial, X, and the vertical, Z, betatron oscillations of accelerated particles relative to the equilibrium in an accelerator with strong focusing, the magnetic structure of which is formed by turning magnets with plane poles and quadrupole lenses. C.L.W.

N64-10620* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York, N.Y.
EVALUATION OF TIROS INFRARED DATA
C. Prabhakara (New York U.) and S. I. Rasool [1962] 14 p refs (NASA RP-80)

Based on the most recent and reliable data of the vertical distribution of water vapor, carbon dioxide, and ozone, atmospheric models for different latitudes and seasons have been derived. Using generalized absorption coefficients, and allowing for their temperature and pressure dependence, the total outgoing flux from such atmospheres was computed for different latitudes and seasons. The results are compared with the TIROS II measurements and the agreement is very satisfactory. Author

N64-10663 Joint Publications Research Service, Washington, D.C.
THE SOUND-INSULATING CAPABILITY OF SHIP HULL STRUCTURES
I. I. Bogolepov July 24, 1963 12 p refs Transl. into ENGLISH of an article from Sudostroyeniye (Leningrad), v. 29, no. 4 (246), Apr. 1963 p 6–9
(JPRS-20319; OTS-63-31368) OTS: $0.50

The relationship of the sound-insulating capability of ship hull coverings to all of their basic parameters, including mass, rigidity, and internal friction, are discussed, and an attempt is made to discover means for rational improvement of the sound-insulating capability of ship hull structures. Conclusions are given for the work described. J.E.T.

24 PHYSICS, PLASMA

Includes fusion; and magnetohydrodynamics. *For related information see:* 05 Astronomy and Astrophysics; 23 Physics, General; and 25 Physics, Solid-State.

N64-10014 Massachusetts Inst. of Tech., Cambridge Research Lab.
INVESTIGATION OF ELECTRON-BEAM INTERACTION WITH A BEAM-GENERATED PLASMA
Ward D. Getty (D.S. Thesis) Jan. 19, 1963 115 p refs
(Contracts DA-36-039-SC-78108 and DA-SIG-36-039-61-G14; NSF Grant G-24073)
(MIT-TR-407)

A strong interaction between an electron beam and a weakly ionized gas is produced by a moderately high-perveance electron gun operating at peak pulse voltages up to 10 kv. As it drifts to the collector, the beam partially ionizes the background gas (argon) in the drift region. After a time delay that is required for the production of plasma by beam ionization, self-excited UHF oscillations are observed. These oscillations are accompanied by several phenomena indicating that a strong interaction takes place. These phenomena are: scattering of the electron beam across the axial magnetic field by oscillatory, electric-field forces; generation of an intense pulse of visible light which occurs simultaneously with the beam scattering; and excitation of electrons to energies above 100 ev. Investigations of these phenomena are described and interpreted. It is concluded that, in a beam-generated plasma system, the oscillations start at a frequency that is determined by the magnetic field, and they become sufficiently intense to impart a significant oscillatory energy to the plasma electrons. Author

N64-10143 Technische Hochschule, Stuttgart (W. Germany) Inst. für Hoch-temperaturforschung
THE HEATING OF HYDROGEN IN A SWIRL-STABILIZED HIGH-CURRENT DISCHARGE [DIE AUFHEIZUNG VON WASSERSTOFF IN EINER WIRBEL-STABILISIERTEN HOCHSTROMENTALADUNG]
Emil Pfender [1963] 25 p refs In GERMAN

A discharge chamber is described in which a vortex-stabilized high-current discharge is operated for heating flowing gases, particularly hydrogen, under atmospheric pressure. The energy exchange of the discharge chamber is 25 kw/cm. The beam temperatures are above 20,000° K. The efficiency of the gas heating is about 95%, although the discharge chamber described is not considered optimal. The electrode loss is about 15%; however, the radiation loss is negligible. The plasma streams coming out of the electrode bores are surrounded by a cold-gas-mantle so that the indicated enthalpies are low. Trans. by I.v.L.

N64-10180* General Dynamics/Astronautics, San Diego, Calif.
PHYSICAL PROCESSES IN A CO-AXIAL PLASMA GUN
T. J. Gooding, B. R. Hayworth, and R. H. Loveberg N.Y. Am. Inst. of Aeron. and Astronautics [1963] 20 p refs Presented at the AIAA Elec. Propulsion Conf., Colorado Springs, Colo., Mar. 11–13, 1963
(NASA Contract NAS3-2501)
(NASA CR-52338)

Investigation of the electromagnetic field system within a coaxial plasma gun as the acceleration proceeds is discussed. Studies of momentum transfer, ion density, and current carriers in the plasma showed that: a layer of radially flowing current is observed to form near the rear of the gun and to advance

toward the gun muzzle and a pulse of E_z (space-charge separation field) accompanies the current layer downstream. Investigation of energy losses indicated that about 65% of the energy originally in the capacitors actually enters the gun barrel, but that all but a small fraction of this has gone into the plasma and is no longer electromagnetic. However, since the directed plasma velocity is still small at this time, it appears that a severe loss to the electrodes and insulator is sustained during this rising phase of the current. Examination of the growth and conditions of a hydromagnetically unstable radial current sheet in a coaxial gun is also discussed. P.V.E.

N64-10246 RAND Corp., Santa Monica, Calif.
THE PLASMA RESONANCE IN INCOHERENT SCATTERING OF RADIO WAVES FROM A FULLY IONIZED PLASMA
Victor Gilinsky and Donald Du Bois July 1963 23 p refs
(Contract AF 49(638)-700)
(RM-3696-PR; AD-411807)

The detailed shape of the plasma resonance in the spectrum of radio waves incoherently scattered from a hot plasma is presented. The calculation includes exactly the lowest order effects of close collisions in the limit of long wavelength of the radiation and high plasma temperature. However, the results are applicable to some experiments to be performed on incoherent scattering of radar beams from the ionosphere. The magnetic field is neglected but this is a good approximation at high frequencies. The effect of collisions with neutral atoms has also been neglected and this restricts the validity of the results to altitudes above about 200 km. A diagrammatic description of electrical interactions of charged particles is employed, and a weakly coupled, high-temperature plasma in thermodynamic equilibrium is assumed. Author

N64-10286* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
OBSERVATIONS ON METALLURGICAL BONDING BETWEEN PLASMA SPRAYED TUNGSTEN AND HOT TUNGSTEN SUBSTRATES
S. J. Grisaffe and W. A. Spitzig Repr. from Trans. Am. Soc. Metals, v. 56, no. 3, Sept. 1963 p 618-628 refs
(NASA RP-41)

The effect of preheating metallurgically polished tungsten substrates on the bonding of plasma sprayed tungsten was investigated. The preheated temperatures of the substrate ranged from 2050° to 2700° F, and the spraying was performed in an inert chamber using a nitrogen atmosphere. When the substrate temperature ranged between 2400° and 2700° F, a metallurgical bond was obtained between the coating and the substrate. At the higher substrate temperature (2700° F), the tungsten substrate recrystallized. However, when the preheating temperature was 2400° F, the substrate showed no signs of recrystallization. Electron micrographs showed that the initial coating-substrate interface was almost completely eliminated. This appears to have occurred by each substrate surface grain growing into the coating. Author

N64-10317 California U., Berkeley. Lawrence Radiation Lab.
CONTROLLED THERMONUCLEAR RESEARCH Semiannual Report, Jan.-June 1963
C. M. Von Atta et al July 22, 1963 151 p refs
(Contract W-7405-eng-48)
(UCRL-10852) OTS: $2.75

The results and conclusions of six-months' research in controlled thermonuclear reactions are described. Included are the Pyrotron (magnetic mirror) Program, the Astron Program, the Livermore Pinch Program, Berkeley plasma research, theoretical and basic experimental plasma physics, and engineering and technological developments. D.E.R.

N64-10470 National Bureau of Standards, Boulder, Colo.
NUMERICAL CALCULATIONS FOR REFLECTION OF ELECTROMAGNETIC WAVES FROM A LOSSY MAGNETOPLASMA
Lillie C. Walters and James R. Wait Nov. 21, 1963 26 p refs
(NBS-TN-205) GPO: $0.25

Extensive numerical results are presented for the reflection coefficient of a horizontally stratified ionized medium. The profiles of electron density and the collision frequencies are both taken to be exponential functions. The dc magnetic field is taken to be horizontal and transverse to the direction of propagation. The specific results described are applicable to the oblique reflection of VLF radio waves in the D layer of the ionosphere for propagation along the magnetic equator. It is confirmed that the reflection coefficient is nonreciprocal in both amplitude and phase. For a wide range of the parameters, the magnitude of the reflection coefficient is greater for west-to-east propagation than for east-to-west propagation. Author

N64-10568 Joint Publications Research Service, Washington, D.C.
PROBLEM OF OPTIMIZING THE OPERATION OF MHD GENERATORS, USSR
A. Ye. Sheyndlin, A. V. Gubsrev, V. P. Kovbasyuk, and V. A. Prokudin Feb. 26, 1963 12 p refs Transl. into ENGLISH of an article from Izv. Akad. Nauk SSSR. Otd. Tekhn. Ener. i Avtomat. (Moscow), No. 6, 1962
(JPRS-17821; OTS-63-21208) OTS: $0.50

The problem of finding the optimum conditions of flow in a duct of a MHD generator and obtaining the maximum power output per length of channel unit or per duct volume unit is investigated. It is proved that given any dependence of the conductivity of the gas on temperature, pressure, and definite internal efficiency of the MHD generator, it is possible, in order to secure minimum length or minimum volume of the channel, to find the optimum flow velocity and the optimum dependence of the local electrical efficiency on temperature. Author

25 PHYSICS, SOLID-STATE

Includes semiconductor theory; and masers. *For related information see*: 09 Electronics; 23 Physics, General; and 24 Physics, Plasma.

N64-10108* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE S-66 LASER SATELLITE TRACKING EXPERIMENT
Henry H. Plotkin Feb. 13, 1963 24 p refs Presented at 3rd Intern. Conf. on Quantum Electron., Paris, Feb. 13, 1963
(NASA TM X-52075; NASA-X-524-63-59) OTS: $2.60 ph, $0.92 mf

The optical tracking experiment to be conducted with the S-66 satellite, the polar ionospheric beacon, is described. The plan consists of illuminating a special satellite-borne reflector with a pulse from a laser and receiving the reflected light on a tracking telescope, which transmits the data to a digital computer. Experiments have shown that this type of optical tracking is feasible, and that the readout of such a system can be expected to be accurate to 5 seconds of arc under the accelerations expected from satellites. D.E.

N64-10313 Texas A. and M. Coll., College Station
THERMOLUMINESCENCE BIBLIOGRAPHY
Ernest E. Angino and N. Grogler (Berne U.) Washington, AEC Div. of Tech. Inform., Oct. 31, 1963 46 p 680 refs
(TID-3911(Rev. 1)) OTS: $1.00

N64-10405 Lockheed Missiles and Space Co., Sunnyvale, Calif.
SUPERCONDUCTIVITY, 1961-1962: AN ANNOTATED BIBLIOGRAPHY, SUPPLEMENT I
Jack B. Goldmann, comp. Apr. 1963 94 p 196 refs
(LMSC-6-90-63-43; SB-63-33)

Current theory, properties, and applications of superconductors as presented for the years 1961 to 1962 are covered. The 196 entries, representing English and foreign language publications, are arranged in alphabetical sequence according to author. Author

N64-10406 Atomics International, Canoga Park, Calif.
ELECTRODELESS DETERMINATION OF ELECTRICAL CONDUCTIVITIES OF MELTS AT ELEVATED TEMPERATURES
S. J. Yosim, L. F. Grantham, E. B. Luchsinger, and R. Wike Oct. 31, 1963 13 p refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-8833) OTS: $0.50

An electrodeless method for measuring the electrical conductivities of metallic and semiconductor melts at elevated temperatures is described. The transformer "eddy current" method, which was capable of measuring conductivities from 1 to greater than 10,000 $(ohm\text{-}cm)^{-1}$, was used. The system was calibrated with Hg at 25° C and tested with Hg to 300° C and Bi to 550° C. The specific conductivities of various compositions of $Bi\text{-}BiI_3$ solutions were measured at 500° C and compared with those measured by an electrode method. The accuracy of the method decreased with decreasing conductivity. Author

N64-10479 Joint Publications Research Service, Washington, D.C.
THEORY OF THE INITIATION OF CRACKS FORMED IN THE BRITTLE FRACTURE OF A CRYSTAL
Yu. M. Plishkin Feb. 12, 1963 18 p refs Transl. into ENGLISH of an article from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Moscow), no. 2, Mar.–Apr. 1962 p 95–103
(JPRS-17578; OTS-63-21099) OTS: $0.50

The results obtained from study of a crystal with a crack and an obstacle to prevent closure indicate the following: (1) in a crystal under stretching, dislocations with a large Burger's vector provide an obstacle for the closure of a crack and render it stable; an increase in the thickness of a wedge leads to propagation of the crack; (2) the number of dislocations necessary for the formation of a propagating crack do not exceed the number of dislocations in a cascade produced by one Frank–Read source (10^2 to 10^3); (3) there is a scaling effect—the smaller the crystal, the greater must be the stretching that leads to the possibility of crack propagation; and (4) the critical value of the thickness of the dislocation plane that results in the propagation of a crack in the crystal depends only on the parameters describing the degree of stretching for a given material and the energy of interaction. R.T.K.

N64-10638 Joint Publications Research Service, Washington, D.C.
GROWING OF CRYSTALS AND AN INVESTIGATION OF THE KINETICS OF THEIR FORMATION
L. M. Belyayev and A. A. Chernov Mar. 21, 1963 20 p Transl. into ENGLISH of an article from Kristallografiya (Moscow), v. 7, no. 5, Oct. 1962 p 659–663
(JPRS-18257; OTS-63-21377) OTS: $0.50

The most important problem in crystallization is felt to be in the area of the formation of defects and of defective crystals. Work on this problem is divided into three areas: (1) investigation of the rise of crystals, (2) investigation of the shift of the phase boundary, and (3) the study of the mechanism and kinetics of the rise of defects. The following tasks and methodological questions are discussed: (a) the rise of crystals of the breadth of the metastable area in phase diagrams, (b) the speed of growth and the multiplicity of forms and properties of crystals of identical chemical composition, and (c) the problem of the rise of metastable conditions during the process of phase transformation when there are sufficiently large deviations from equilibrium. R.T.K.

26 PROPELLANTS AND COMBUSTION

Includes fuels; igniters; and oxidizers. *For related information see*: 07 Chemistry; and 27 Propulsion.

N64-10005 Deutshe Versuchsanstalt für Luft- und Raumfahrt, Munich (W. Germany) Inst. für Flugtrieb- und Schmierstoffe
RELATIONS BETWEEN THE CHEMICAL CONSTITUTION AND THE IGNITION CHARACTERISTICS OF HYPERGOLIC ROCKET PROPELLANT COUPLINGS [ZUSAMMENHANGE ZWISCHEN DER CHEMISCHEN KONSTITUTION UND DEM ZUNDVERHALTEN HYPERGOLER RAKETERTREIBSTOFF-PAARUNGEN]
Gunter Spengler 1963 17 p In GERMAN Presented at the Ann. Meeting of the Wiss. Ges. Luft- und Raumfahrt, Munich, Oct. 8–12, 1963

The relationship between the chemical composition and the ignition characteristics of hypergolic rocket bipropellants is reviewed. It is possible to determine rapidly and reproducibly the ignition delay of liquid bipropellants with the aid of simple measuring equipment. The equipment, which has been described in detail in a previous paper, consists of a closed combustion chamber and an apparatus for a variable injection angle. This equipment enables the rapid choice of a suitable bipropellant and the determination of the relationship between hypergolicity and chemical composition. The results of measurements on various bipropellants are discussed.
Trans. by I.v.L.

N64-10128 General Dynamics/Astronautics, San Diego, Calif.
LIQUID HYDROGEN TECHNOLOGY
Sept. 1962 313 p refs
(AE62-0774)

This report contains information on liquid hydrogen as related to its use as a propellant of space vehicles, e.g., the hydrogen fueled Centaur for NASA. The following areas are included: (1) manufacture; (2) current methods for transporting liquid hydrogen; (3) the four main hazards associated with the use of liquid hydrogen with respect to the design and operation of a liquid-hydrogen system; (4) material problems encountered with liquid and gaseous hydrogen contact; (5) cryogenic insulation; (6) transfer; (7) liquid-hydrogen measurements; (8) propulsion systems that presently use or contemplate using

liquid hydrogen; (9) sloshing; (10) vortexing; (11) propellant heating; (12) zero-gravity behavior; (13) space storage; and (14) properties. I.v.L.

N64-10148 Hellmuth Walter GmbH, Kiel (W. Germany)
H_2O_2 AS AN ENERGY SOURCE FOR SPACE FLIGHT [H_2O_2 ALS ENERGIETRAGER FUR DIE RAUMFAHRT]
Emil Kruska [1963] 13 p In GERMAN Presented at the Ann. Meeting of the Wiss. Ges. Luft- und Raumfahrt, Munich, Oct. 8–12, 1963

Five methods for using H_2O_2 power in space travel are discussed. These methods are: (1) simple decomposition, (2) decomposition and combustion with an average- or high-energy propellant, (3) combustion in a solid–liquid bipropellant system, and (4) as an oxygen supply in a fuel element. The various uses of H_2O_2 include: (1) warming and air purification of space cabins, (2) driving turbogenerators, and (3) utilization in propellants. I.v.L.

N64-10426 Atomic Energy Commission, Washington, D.C. Div. of Technical Information
FUEL MANAGEMENT SYMPOSIUM Held at New York Operations Office, Sept. 27, 1963
[1962] 142 p refs
(TID-7665) OTS: $2.50

The following topics were discussed at the fuel-management symposium: (1) fuel-management study of the Senn reactor; (2) physics analysis of fuel management in the Senn reactor; (3) fuel-cycle analysis of fuel management in the Senn reactor; (4) physics model for fuel-management study of the spectral shift reactor and recalculations of costs of the heavy-water reactor; (5) recent results of fuel-management studies of a thorium system; (6) the application of multiregion loading and fuel cycling to large, pressurized water reactors; and (7) fuel-management study of a water-moderated UO_2PuO_2 system. R.T.K.

27 PROPULSION

Includes airbreathing, electric, liquid, nuclear, and solid propulsion. *For related information see*: 04 Aircraft; 06 Auxiliary Systems; 26 Propellants and Combustion; and 30 Space Vehicles.

N64-10046* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
ELECTRIC PROPULSION FOR MANNED MISSIONS
Robert J. Denington, William J. Le Gray, and Russell D. Shattuck *In* Am. Inst. of Aeron. and Astronautics Eng. Problems of Manned Interplanetary Exploration Oct. 1963 p 145–159 refs (See N64-10040 01-01) AIAA: $4.00 members, $8.00 nonmembers

Electric propulsion offers the potential of delivering and returning relatively large payload fractions from the planets. Conclusions reached in respect to electric propulsion for manned missions include the following: (1) electric propulsion appears to be competitive with chemical and nuclear propulsion providing lightweight, long-lived engines are developed; (2) at present, the equipment which can be built is much too heavy, presents cooling problems, and introduces radiation-shielding complexities; (3) nuclear–electric power supply poses the most difficult problems; (4) of the two powerplants (thermionics and Rankine) considered, the Rankine-cycle technology is more advanced and has a broader technology base; and (5) at present neither powerplant is preferable. P.V.E.

N64-10104* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A METHOD FOR PRELIMINARY DETERMINATION OF COMPONENT STIFFNESS REQUIREMENTS FOR GIMBALED ENGINE SYSTEMS
Charles E. Lifer Apr. 5, 1962 20 p refs
(NASA TM X-51071; MTP-VE-S-62-2) OTS: $1.60, $0.80 mf

To facilitate preliminary design of gimbaled engine systems which will meet vibration requirements of hydraulic and electronic controls, this report presents a method for approximate determination of component requirements. The report is intended to show the required relationships between the design frequency, the engine mass and stiffness, the actuation system stiffness, and support structure stiffness. In addition, it presents procedures for determining these component properties. Since the report is for preliminary study only, and detailed mass distribution and stiffness information will not be available, a single-degree-of-freedom analysis method was chosen. The predicted masses of gimbaled components are assumed to be concentrated at one location. The support structure is treated as a linear spring. Because of these simplifying assumptions, the results of an analysis with this method must be used conservatively. Author

N64-10135 Deutsche Versuchsanstalt für Luft-und Raumfahrt, Porz (W. Germany) Inst. für Luftstrahlantriebe
SUPERSONIC COMBUSTION– DESIGN AND SPECIAL RESEARCH INSTITUTIONS [UBERSCHALLVERBRENNUNG–ZWECK UND EIGENE VERSUCHSEINRICHTUNGEN]
Friedemann Suttrop [1962] 41 p refs In GERMAN

A thermodynamic comparison between fuel combustion in supersonic and subsonic combustion, with preceding vertical thrust, indicates that the use of supersonic combustion, along with the necessary supply of large quantities of heat, can lead to an increase in service life of jet engines for hypersonic flight Mach numbers. The most important technical prerequisite for supersonic combustion is to supply the airstream with a sufficiently high gas temperature (at least 2000° K). It is anticipated that with supersonic combustion, flight Mach numbers over 12 will be reached. I.v.L.

N64-10144 Deutsche Versuchsanstalt fur Luft- und Raumfahrt, Mulheim an der Ruhr (W. Germany) Inst. fur Raumfahrtforschung
ELECTRODELESS RING DISCHARGE AS A MEANS OF THRUST GENERATION: DETERMINATION OF THE ENERGY TRANSMISSION EFFICIENCY AND THE ASSESSMENT OF THE KINETIC ENERGY OF THE GAS [ELEKTRODENLOSE RINGENTLADUNG ALS MITTEL ZUR SCHUBERZEUGUNG: BESTIMMUNG DES ENERGIEUBERTRAGUNGSWIRKUNGSGRADES UND ABSCHATZUNG DER KINETISCHEN ENERGIE DES GASES]
A. Werner Preukschat [1963] 23 p refs In GERMAN Presented at the Ann. Meeting of the Wiss. Ges. Luft- und Raumfahrt, Munich, Oct. 8–12, 1963

The energy-transfer efficiency of a resonant discharge circuit can be determined by a comparison between the energies with and without gas discharge. It must, however, be assumed that an exponentially damped sinusoidal flow exists in the circuit. Furthermore, it must be assumed that in the presence of a plasma, the valid differential equation for the resonant discharge circuit can be relinearized by assuming

mean values. The kinetic efficiency of a simple model was obtained. The kinetic energy efficiency was deduced from the kinetic energy of the plasma, which resulted from magnetostatic pressure and pinch effect. Trans. by I.v.L.

N64-10220 Honeywell Research Center, Hopkins, Minn.
ION PROPULSION A Report Bibliography, Jan. 1959– Apr. 1963
C. S. Rank, comp. Apr. 1963 37 p refs
(RB-63-3)

The references of this bibliography are limited to ionic propulsion of the contact or bombardment type and to studies which are specifically related to the problems of ionic propulsion. P.V.E.

N64-10287* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
ELECTRIC PROPULSION
W. E. Moeckel Repr. from Science, v. 142, no. 3589, Oct. 11, 1963 p 172–178 refs
(NASA RP-42)

The benefits of electric propulsion, namely, long lifetime, high impulse, and smaller size, are discussed to provoke thought on this type of propulsion as a possible system for lunar and interplanetary flight. The useful propulsive energy of such a system is said to be greater than its corresponding chemical system. Its propellant heating capacity using solar or nuclear power is far greater than corresponding chemical systems. Its propellant ejection velocity is said to be unlimited; the thrust-to-power ratio is nearer the optimum than with any chemical system; and the possible power-generation systems to be used with such electric powerplants are almost limitless. It can operate in space with a lifetime of 1 year or more, having a low specific weight, and with a total output of several hundred to several thousand kilowatts. D.E.R.

N64-10623* Rocketdyne, Canoga Park, Calif.
PROPULSION REQUIREMENTS FOR SOFT LANDING IN EXTRATERRESTRIAL ENVIRONMENTS. VOLUME I– SUMMARY AND PROPULSION DESIGN GUIDE Final Report
M. S. Bensky Feb. 1963 140 p refs
(NASA Contract NAS7-124)
(NASA CR-52486; R-5061) OTS: $10.50 ph, $4.40 mf

Landing trajectory concepts applicable to landings on the Moon, Mars, Venus, Mercury, and the Earth are described. For the most suitable landing techniques, the required propulsive maneuvers are defined, and the optimum characteristics of propulsion systems for performance of these maneuvers are presented. Investigations to determine appropriate interplanetary trajectories upon which to base landing analyses and to evaluate takeoff propulsion requirements are discussed. In addition, data illustrating the effect of variation of propulsion parameters on vehicle velocity requirements and payload capabilities are included. Author

28 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. *For related information see*: 05 Astronomy and Astrophysics; 16 Life Sciences; and 29 Space Sciences.

N64-10053 Aeronautical Research Council (Gt. Brit.)
THE EFFECT OF SOLAR RADIATION PRESSURE ON THE ATTITUDE CONTROL OF AN ARTIFICIAL EARTH SATELLITE
N. E. Ives London, HMSO, Apr. 1961 32 p ref
(ARC-R&M-3332; replaces RAE-TN-GW-570; ARC-23098)
HMSO: 12s 6d

This report presents an account of the demand made by solar radiation pressure on the attitude-control system of an earth satellite whose external configuration is in the shape of a rectangular prism, the surfaces being assumed to be perfectly reflecting. Expressions determining the amount of angular impulse that must be supplied by an attitude-control system in the course of a year in order to provide perfect stabilization for a space-stabilized satellite, and an earth-pointing satellite in a nonprecessing orbit, are developed. Examples are given for particular cases and further examples include a comparison of the radiation-pressure torque with the torque set up by the earth's gravitational field, and the attitude deviations arising as a result of radiation pressure on an earth-pointing satellite employing gravity-gradient stabilization alone. Author

N64-10167* Franklin Inst., Swarthmore, Pa.
SOLAR-PRODUCED HEAVY NUCLEI DURING NOVEMBER 1960
Martin A. Pomerantz and Louis Witten (RIAS) Repr. from Space Res. III, Proc. of 3rd Internatl. Space Sci. Symp., Washington, Apr. 30–May 9, 1962 p 692–699 refs Amsterdam, North-Holland Pub. Co., 1963
(NASA Contract NASr-79)

The arrival of solar-produced heavy nuclei ($Z \geq 6$) was observed by equipment aboard Explorer VII (1959 Iota). Comparison of the measurements of multiply-charged particles with SUI Geiger counter data recorded simultaneously on the same tapes indicates that the magnetic rigidity spectra of the solar protons and heavy nuclei were similar. In the narrow range of latitudes for which the analysis can be performed, the integral flux varied as $R^{-8.5}$. The proton–heavy nucleus ratio remained the same except during the last pass, for which it was larger by a factor of 4. After each of the flares, the intensity of the solar heavy nuclei decayed with time, t, following onset as $t^{-3.1}$. Author

N64-10297* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVIDENCE FOR THE EFFECT OF CORPUSCULAR RADIATION ON THE IONOSPHERE [Statistical Analysis of Ionospheric Data, 1937-1957]
F. Mariani May 1963 40 p refs
(NASA TM X-51058; X-615-63-94) OTS: $3.60 ph, $1.40 mf

The correlation of maximum electron density of F region at noon with solar activity is carefully investigated, during the years 1937 to 1957 for both long-term and month-to-month variations, in all existing observatories. On the basis of noon-equilibrium between electron loss and ion production by solar radiation, the presence of an ionizing effect, strongly dependent of the solar activity and peaked at latitudes of 55° to 65°, is shown. This latitudinal variation suggests a corpuscular origin of such ionizing effect. The possible source of a corpuscular flux is discussed. The energy of the ionizing particles is in the range of Kev. Quantitative evidence is given that Van Allen belts could be an important, or possibly the main, source. Author

N64-10359* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SYNCHROTRON RADIATION CALCULATIONS FOR THE ARTIFICIAL RADIATION BELT

M. P. Nakada Repr. from J. Geophys. Res., v. 68, no. 13, July 1, 1963 p 4079-4089 refs
(NASA RP-67)

Synchrotron radiation from the artificial radiation belt is calculated in some detail. The angular distribution of the electrons and of the synchrotron radiation is considered. Omnidirectional electron fluxes according to Van Allen, Frank, and O'Brien, Brown and Gabbe are used to derive directional fluxes. Temperatures as a function of frequency and of the geomagnetic latitude at 30 Mc are calculated. Results are compared with measurements. Author

N64-10362 Washington U., St. Louis, Mo.
THE FRAGMENTATION OF HEAVY COSMIC RAY NUCLEI IN LIGHT ELEMENTS
M. W. Friedlander, K. A. Neelakanten, S. Tokunaga, G. R. Stevenson, and C. J. Waddington (Bristol U. (Gt. Brit.)) Repr. from Phil. Mag., v. 8, no. 94, Oct. 1963 p 1691-1712 refs

The interaction and absorption fragmentation paran ters and mean free paths of heavy, $Z \geq 3$, cosmic-ray nuclei have been measured in polyethylene $(CH_2)_n$ and teflon $(CF_2)_n$. Within the statistical accuracy of these results it has been shown that previously deduced values of the fragmentation parameters in the atmosphere were essentially correct, as were the mean free paths. Tentative values have been deduced for the fragmentation parameters in hydrogen, and these have been compared with those assumed previously. The significance of these results is discussed. Author

N64-10377 Atomic Energy of Canada Ltd., Chalk River, Ontario. Deep River Lab.
ASYMPTOTIC DIRECTIONS OF APPROACH OF VERTICALLY INCIDENT COSMIC RAYS FOR 85 NEUTRON MONITOR STATIONS
C. J. Hatton and D. A. Carswell Aug. 1963 99 p refs
(AECL-1824; CRGP-1165) Available from Scientific Document Distribution Office, Atomic Energy of Canada Ltd., Chalk River, Ontario: $2.00

Using the Bendix G-20 computer, the asymptotic directions of approach for vertically incident cosmic rays in a high-degree simulation of the geomagnetic field have been calculated. The calculations have been made for standard sets of rigidities which are convenient for further computation. The results for 85 cosmic ray stations are presented both in tabulated and in graphical form. Author

N64-10480 Joint Publications Research Service, Washington, D.C.
RADIATION BELTS NEAR CELESTIAL BODIES
G. I. Pokrovskiy Feb. 12, 1963 7 p Transl. into ENGLISH of an article from Priroda (Moscow), no. 8, Aug. 1962
(JPRS-17582; OTS-63-21103) OTS: $0.50

Radiation belts are formed and exist in the proximity of the earth and other celestial bodies which possess a sufficiently intensive magnetic field. The solution of the problem of the existence, size, and intensity of a magnetic field in the proximity of celestial body might be obtained by starting from the hypothesis that the magnetic field is caused by the compressed core inside the celestial body. Assuming that the composition of the celestial body is identical with that of the earth, the relation of the compressed core to the size of the celestial body can be determined. This shows that celestial bodies with a radius of less than 6000 km have no compressed core and, thus, no magnetic field and no radiation belt. Applying this inference to celestial bodies in the proximity of the Earth, it can be said that the Moon, Mercury, Mars, and the satellites of any planet cannot have radiation belts and that the cosmonauts flying to these celestial bodies need not fear the injurious effect of radiation. Jupiter, Saturn, and the other planets except Venus, certainly have radiations belts. Whether or not Venus has a radiation belt is not known. I.v.L.

N64-10602* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
TIROS II RADIATION DATA CATALOG, VOLUME ONE
Aug. 15, 1961 365 p Work performed jointly with Weather Bureau, Washington
(NASA TM X-51116) OTS: $21.00 ph, $11.15 mf

This catalog describes the mapping procedures which have been employed in processing the TIROS II radiation data utilizing Final Meteorological Radiation (magnetic) Tapes and automatic data-processing equipment. Sample grid point analyses of radiation data from 50 orbits are presented and serve to introduce TIROS II radiation data to the meteorological community. An index of all existing Final Meteorological Radiation Tapes is included. Author

N64-10603* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
TIROS III RADIATION DATA CATALOG
George W. Nicholas, Harold P. Thompson, Melvin Weinstein et al Dec. 15, 1962 392 p Included is a Users' Manual Work performed jointly with Weather Bureau, Washington
(NASA TM X-51117) OTS $21.00 ph, $11.96 mf

This catalog describes the mapping procedures which have been employed in processing the TIROS II and III medium-resolution radiation data utilizing Final Meteorological Radiation (magnetic) Tapes and automatic data-processing equipment. Radiation grid-print maps are presented for five specific study cases from the TIROS III data. Supplemental surface and upper-air analyses, and TIROS III television pictures are included for some of the cases. An index of all existing Final Meteorological Radiation Tapes for TIROS III is included. Author

N64-10614 Bellcomm, Inc., Washington, D.C.
MODELS FOR SPACE ENVIRONMENTAL HAZARDS: RADIATION
H. J. Schulte Jan. 31, 1963 20 p refs

Engineering design models are proposed for the penetrating radiation hazards of space. Charged-particle and electromagnetic radiation in galactic and solar cosmic rays are discussed, as well as trapped particles in natural and artificial belts. Author

N64-10651 Joint Publications Research Service, Washington, D.C.
MONTHLY FORECASTS OF THE F_2 LAYER'S MAXIMUM USABLE FREQUENCY
V. F. Belugin May 17, 1963 23 p refs Transl. into ENGLISH from Tr. Inst. Zemnogo Magnetizma, Ionosferi i Rasprostraneniya Radiovoln (Moscow), no. 19(29), 1961 p 140-150
(JPRS-19245; OTS-63-21842) OTS: $0.75

Two forms of presentation of the maximum usable frequency (MUF) forecasts of the F2 layer are presented, along with the method for preparation of forecasts in the preferred form. These two methods, one utilizing world-map forecasts and the other utilizing zonal forecasts were found to be comparable when both use the same limited number of ionospheric

stations. A new method is proposed which can be used even when preparing forecasts from data supplied by a very limited number of ionospheric stations. C.L.W.

N64-10662 Joint Publications Research Service, Washington, D.C.
STRUCTURE OF THE F-LAYER AND REASONS FOR CONVECTION IN THE EARTH'S CORE
S. I. Braginskiy July 16, 1963 9 p refs Transl. into ENGLISH of an article from Doklady Akad. Nauk SSSR (Moscow), v. 149, no. 6, Apr. 21, 1963 p 1311–1314
(JPRS-20183; OTS-63-31292) OTS: $0.50

A hypothesis on the structure of the F layer at the boundary of the earth's inner core is given, and the nature of convection in the earth's core is discussed. Studies of the Jeffries effect (velocity drop in the F layer) and the Gutenberg effect (wave dispersion in the transient layer) are utilized in forming the hypothesis of the structure of the F layer. C.L.W.

29 SPACE SCIENCES

Includes space chemistry; cosmology; lunar and planetary exploration; and theoretical analysis of orbits and trajectories. *For space biology see*: 16 Life Sciences. *For related information see*: 05 Astronomy and Astrophysics; 12 Geophysics; and 22 Navigation and Guidance.

N64-10099* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
EARTH – VENUS TRAJECTORIES, 1968-69, VOLUME 4, PART B
V. C. Clarke, Jr., R. Y. Roth, W. E. Bollman, T. W. Hamilton, and C. G. Pfeiffer Aug. 15, 1963 789 p refs
(NASA Contract NAS7-100)
(NASA CR-622268; JPL-TM-33-99, Vol. 4, Pt. B) OTS: $31.00 ph, $23.87 mf

The results of extensive machine computations of three-dimensional ballistic Earth–Venus trajectories for the launch date interval of December 26, 1968, to February 3, 1969, are presented in tabular form. Data include heliocentric and planetocentric conic computations, differential corrections, midcourse guidance, orbit determination, and accuracy of computations. An analytical model for interplanetary trajectories and an explanation of the trajectory tables are also included. J.E.T.

N64-10100* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
EARTH – VENUS TRAJECTORIES, 1968-69, VOLUME 4, PART C
V. C. Clarke, Jr., R. Y. Roth, W. E. Bollman, T. W. Hamilton, and C. G. Pfeiffer Sept. 3, 1963 790 p refs
(NASA Contract NAS7-100)
(NASA CR-52142; JPL-TM-33-99, Vol. 4, Pt. C) OTS: $31.00 ph, $23.90 mf

The results of extensive machine computations of three-dimensional ballistic Earth–Venus trajectories for the launch date interval of February 4 to March 15, 1969, are presented in tabular form. Data include heliocentric and planetocentric conic computations, differential corrections, midcourse guidance, orbit determination, and accuracy of computations. An analytical model for interplanetary trajectories and an explanation of the trajectory tables are also included. J.E.T.

N64-10179* Aerojet-General Corp., Azusa, Calif. Chemical Products Div.
RESEARCH ON PROCESSES FOR UTILIZATION OF LUNAR RESOURCES Quarterly Report [22 Apr.–31 July 1963]
S. D. Rosenberg, G. A. Guter, and F. E. Miller Aug. 1963 29 p
(NASA Contract NAS7-225)
(NASA CR-52318; Rept. 0765-01-1) OTS: $2.60 ph, $1.07 mf

Laboratory apparatus for studying the catalytic reduction of carbon monoxide with hydrogen has been designed, fabricated, and operated. Excellent yields of methane (to 99.0%) and water (to 100%) were achieved; minor amounts of carbon dioxide were formed as a byproduct. A negligible amount of carbon (less than 0.1%) was deposited on the catalyst during several hours of operation. The reaction appears very promising as a step in the reduction of silicate materials (lunar new materials) to produce oxygen. Author

N64-10182* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
MICROMETEOROID SATELLITE (EXPLORER XIII) STAINLESS-STEEL PENETRATION RATE EXPERIMENT
Washington, NASA Oct. 1963 48 p refs
(NASA TN D-1986) OTS: $1.25

This report describes the development of the experiment and the conclusions drawn from the satellite's brief lifetime in orbit. Author

N64-10288* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
SOLAR CONCENTRATORS: STATUS OF SOLAR ENERGY COLLECTOR TECHNOLOGY
Atwood R. Heath Jr. Repr. from Progr. Astron. Aeron., V. II, 1963 p 655–668 refs Presented at the ARS Space Power Systems Conf., Santa Monica, Calif., Sept. 25–28, 1962
(NASA RP-45)

A survey has been made of the state-of-the-art of solar energy collector development. Various types of collector concepts along with methods and materials of construction are discussed. The concentrating ability and efficiency are presented for several collectors which have been constructed to date. For the various collectors, analyses are made with regard to such factors as: unit weight, specific power, launch package volume, and operating temperature of the energy conversion device. Author

N64-10289* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY MAGNETIC FIELDS AS A CAUSE OF COMET TAILS
David B. Beard and M. Paul Nakada Repr. from Nature (London), v. 199, no. 4893, Aug. 10, 1963 p 580 refs
(NASA RP-48)

This communication suggests that the gases in cometary comas are ionized by the solar wind of ionized hydrogen embedded in a magnetic field, and that an interplanetary magnetic field will couple the cometary gas to the solar wind. The comet head is regarded as a densely ionized plasma, essentially stationary in a high-pressure solar wind containing a low-pressure magnetic field moving with the wind. The interplanetary magnetic field is compressed against the obstacle offered by the comet, so that the magnetic pressure increases to approximate equality with the stream pressure. The effects of the directionality of the interplanetary field in relation to the solar wind velocity are discussed. Fluctuations in solar wind pressure, or

in the magnetohydrodynamic waves the fluctuations generate, will also create the accelerations in comet tails which first led Biermann to deduce the presence of the solar wind. M.P.G.

N64-10331* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANGULAR SCATTERING FROM IRREGULARLY SHAPED PARTICLES WITH APPLICATION TO ASTRONOMY
Bertram Donn and Robert S. Powell Repr. from I.C.E.S., 1963 p 151–158 refs
(NASA RP-64)

The scattering properties of irregularly shaped zinc oxide particles were investigated in order to evaluate the consequences of comparing the observed data with spheres and, thereby, gain a better understanding of which scattering parameters are most definitive from the viewpoint of gathering optimal astronomical data. In order to alleviate the incompleteness for the present tables for spheres and to reduce the labor in making comparisons with many size distributions, a table was prepared of scattering intensities and an integrated function, $F(\alpha, \theta, m)$, for the following intervals in the index of refraction, the scattering angle measured from the forward direction, and the size parameter: $m = 1.2(0.2)2.4$, $\theta = 0°(5°)180°$, $\alpha = 2\pi r/\lambda = 0.1(0.1)100$. The integrated function is given by: $F(\alpha,\theta,m) = \int_{0.1}^{\alpha} I(\alpha',\theta,m)d\alpha'$. This function permits quick and simple comparison of scattering from many size distributions. Typical results concerning the scattering from irregularly shaped zinc oxide particles are presented and compared with equivalent theoretical results for spheres. I.v.L.

N64-10373* Arizona U. Tucson
COMMUNICATIONS OF THE LUNAR AND PLANETARY LABORATORY. VOLUME 2, NUMBER 24-29
William K. Hartmann et al 1963 113 p refs
(NASA Grant NsG-161-61)
(NASA CR-52400) OTS: $9.60 ph, $3.59 mf

The system of radial structures in the uplands surrounding Mare Imbrium contains a variety of objects and has modified certain pre-mare features. Many of the structures cannot be the result of gouging by flying fragments. They may have formed along radial fractures associated with an Imbrium impact. The morphological evidence for crustal breakup suggests that this impact occurred during a high-temperature stage in the outer layers of the moon when the surface was in tension and the subsurface plastic. Author

N64-10374* Arizona U., Tucson
COMMUNICATIONS OF THE LUNAR AND PLANETARY LABORATORY. VOLUME 2, NUMBER 30 [THE SYSTEM OF LUNAR CRATERS, QUADRANT I]
S. W. G. Arthur et al 1963 84 p refs
(NASA Grant NsG-161-61)
(NASA CR-52401) OTS: $8.10 ph, $2.72 mf

The designation, diameter, position, central peak information, and state of completeness for each discernible crater in the first lunar quadrant with a diameter exceeding 3.5 km are listed. The catalog contains about 2,000 items and is illustrated by a map in 11 sections. Author

N64-10403 Royal Aircraft Establishment, Farnborough (Gt. Brit.)
A COMPARISON OF THE SATELLITE ORBIT THEORIES OF KOZAI AND MERSON AND THEIR APPLICATION TO VANGUARD 2
R. H. Merson London, Min. of Aviation, July 1963 41 p refs
(RAE-TN-SPACE-42)

The theories of Kozai and Merson relating to the drag-free motion of an earth satellite are compared, and formulas are derived for the first-order differences between the orbital elements used in the two theories. With the aid of these formulas, the second-order terms in the two theories are shown to be consistent. The R.A.E. Orbit Improvement Programme for a PEGASUS computer has been used to determine the orbital elements of VANGUARD 2 (1959 α1) for the period February to July, 1959 from photoreduced Baker–Nunn camera observations. These elements have been compared with those determined at the Smithsonian Institution Astrophysical Observatory, which are based on Kozai's theory. The differences between the sets of elements are fully explained by the theoretical formulas previously developed. Author

N64-10440* Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE DETERMINATION OF ABSOLUTE DIRECTIONS IN SPACE WITH ARTIFICIAL SATELLITES Research in Space Science
Aug. 16, 1963 28 p refs
(NASA Grant NsG-87-60)
(NASA CR-52505; SAO Special Rept. 133) OTS: $2.60 ph, $1.04 mf

Baker–Nunn cameras have been modified to perform simultaneous observations. When only two stations are involved in simultaneous observing, the directions in an absolute system of reference of the line connecting the two stations can be determined. Fifty-six pairs of simultaneous observations between stations Villa Dolores, Argentina; Arequipa, Peru; Curaçao, Netherlands Antilles; Jupiter, Florida; and Organ Pass, New Mexico indicate that an accuracy of better than 1 min of arc can be expected. Author

N64-10461* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
ULTRAVIOLET SPECTROSCOPY OF PLANETARY ATMOSPHERES
Charles A. Barth Repr. from "Dyn. of Manned Lifting Planetary Entry", July 1963 p 82–94
(NASA Contract NAS7-100)
(NASA CR-52461; TR-32-516)

The ultraviolet spectrum of a planetary atmosphere is produced by charged-particle bombardment and solar radiation. The ultraviolet aurora and dayglow may be observed from a rocket within the atmosphere, from a satellite above the atmosphere, and from a space probe flying by the planet. The spectrum of the ultraviolet dayglow is the result of molecular scattering, abosrption, resonance reradiation, and fluorescence of the incident solar radiation. The composition of the upper atmosphere may be determined from a quantitative analysis of the dayglow spectra. The spectrum of the ultraviolet aurora identifies many of the atoms and molecules that are present in the atmosphere. The geographic distribution of the aurora is believed to be the result of the interaction of the solar plasma with the planet's magnetosphere. The details of the spectrum will provide information on the energy and nature of the bombarding particles. Author

N64-10604* National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICS AND SPACE BIBLIOGRAPHY FOR SECONDARY GRADES

Washington, Govt. Print. Off. [1963] 53 p refs 2d ed., Jan. 1960–Apr. 1963 Comp. for NASA by Natl. Aerospace Res. Council
(NASA EP-2) GPO: $0.35

An annotated bibliography is presented covering the following areas: (1) Books—space travel and space exploration, tools for the exploration of space, astronomy, biography, careers in space research and technology, and aviation and aeronautics; (2) Reference Materials—bibliographies, dictionaries, encyclopedias, etc; (3) Teaching Aids—pamphlets, booklets, charts, etc., films and filmstrips, author and title indexes, and publishers' addresses. R.T.K.

N64-10605* National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICS AND SPACE BIBLIOGRAPHY OF ADULT AEROSPACE BOOKS AND MATERIALS
Washington, Govt. Print. Off. [1963] 47 p refs 2d ed., Jan. 1960–Apr. 1963
(NASA EP-3) GPO: $0.30

Bibliographic topics include: space exploration, space science, space research projects, space medicine, astronomy, aviation, and aeronautics; reference and miscellaneous materials; and films and filmstrips. J.E.T.

N64-10606 National Bureau of Standards, Boulder, Colo. Central Radio Propagation Lab.
COMPILATIONS OF SOLAR-GEOPHYSICAL DATA. ABSTRACTED FROM CRPL-F, PART B
Mar. 1963 43 p

Tables and graphs for the daily solar activity for the year 1962 and the first quarter of 1963 are given. Included are the daily solar indices for January and February 1963, smoothed sunspot numbers, relative sunspot numbers for 1962, solar flux values at 2800 Mc/s for 1962, classifications of sunspots, coronal line emission indices, solar flare data for November 1962 and February 1963, and solar radio emission data, as well as cosmic ray indices. D.E.R.

N64-10607 National Bureau of Standards, Boulder, Colo. Central Radio Propagation Lab.
COMPILATIONS OF SOLAR-GEOPHYSICAL DATA. ABSTRACTED FROM CRPL-F, PART B
Apr. 1963 32 p

Tables and graphs for the daily solar activity for the first quarter of 1963 are given. Included are the daily solar indices for February and March 1963, smooth sunspot numbers (predicted and observed), sunspot classification, coronal line emission indices, solar flare data, solar radio emission data, and solar noise burst data. D.E.R.

N64-10608 National Bureau of Standards, Boulder, Colo. Central Radio Propagation Lab.
COMPILATIONS OF SOLAR-GEOPHYSICAL DATA. ABSTRACTED FROM CRPL-F, PART B
June 1963 50 p

Tables and graphs of the daily solar activity are given for the first half of 1963. Included are the daily solar indices, sunspot numbers, the calcium plage and sunspot regions, coronal line emission indices, solar flare observations for February and May, a table of the ionospheric effects of the solar flares, and solar radio emission data. D.E.R.

30 SPACE VEHICLES

Includes launch vehicle-spacecraft combinations; missile systems; operating problems; safety devices; and stability and control. *For boosters and launch vehicles see:* 31 Space Vehicles (Launch Vehicles). *For related information see:* 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-10091* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE ATTITUDE DETERMINATION: DIGITAL SENSING AND ONBOARD PROCESSING
J. S. Albus and D. H. Schaefer July 1963 22 p refs
(NASA TM X-50996; NASA-X-631-63-133) OTS: $2.60 ph, $0.86 mf

The paper consists of a description of the digital solar aspect sensor and a discussion of the onboard data processing systems. The particular attitude determination systems discussed include those flown on Explorer X, XII, XIV, as well as those to be flown on the Atmospheric Structures Satellite (S-6), the Relay Satellite, and the Interplanetary Monitoring Probe (IMP). Some unusual data are presented, and future system possibilities are examined. Author

N64-10105* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A WIND TUNNEL INVESTIGATION TO DETERMINE SOME AERODYNAMIC HINGE MOMENTS ON THE MODEL ENGINES OF A SATURN I, BLOCK I CONFIGURATION
Glenn T. Boyd Apr. 26, 1963 203 p refs
(NASA TM X-51044; MTP-AERO-63-31) OTS: $14.00 ph, $6.29 mf

Test variables for this investigation included Mach number, jets on and off, angle of attack, nozzle gimbal angle, and engine shroud configuration. Data presented in this report primarily depict the pressure rise over the surface of a nozzle, and the influences caused by Mach number, jet on and off, angles-of-attack, gimbal angles, and engine shroud configuration. Also included in this report are center star (flame shield) and base pressure distributions, and the local static pressure distribution over one quadrant of the model afterbody. Author

N64-10106* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STABILITY CONSIDERATIONS OF A SPACE VEHICLE IN BENDING OSCILLATIONS FOR VARIOUS CONTROL SENSORS
Robert S. Ryan Aug. 20, 1962 25 p refs
(NASA TM X 51081; MTP-AERO-62-64) OTS: $2.60 ph, $0.95 mf

This report identifies methods of stabilization, problems encountered, and some basic definitions and trends for elastic oscillations. Simplified techniques for filter design for position gyros, rate gyros, accelerometers, and angle-of-attack meters are presented. It has been determined that angle-of-attack meters and position gyros should be located at negative bending-mode slopes; accelerometers should be placed at negative bending-mode deflection. These bending modes were normalized to 1 at the engine swivel point. The location of rate gyros depends upon the stabilization philosophy chosen. A scheme using multisensors is presented as a further means of stabilizing bending modes. Author

N64-10610 Aerojet-General Corp., Sacramento, Calif. Solid Rocket Plant

ENVIRONMENTAL-TEST PROGRAM FOR RELIABILITY OF FIRST-AND SECOND-STAGE POLARIS MODEL A1 MOTORS Final Report

S. J. Mars Mar. 15, 1963 54 p refs

(SRP-314)

This is the final report of the environmental-test program for reliability of 11 first-stage and 8 second-stage Polaris Model A1 motors. This program was conducted to demonstrate that the motors can perform successfully after being subjected to thermal and mechanical stresses simulating those to which tactical motors are subjected in their environment. Ten of the 11 first-stage motors and 7 of the 8 second-stage motors were statically fired successfully at the completion of the environmental-test program. Author

31 SPACE VEHICLES (LAUNCH VEHICLES)

Includes boosters; clustered rockets; and multistage rockets. *For propulsion engines see*: 27 Propulsion. *For manned space capsules, satellites, and sounding rockets and space probes see*: 32 Space Vehicles (Spacecraft). *For launch vehicle-spacecraft combinations see*: 30 Space Vehicles. *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-10375* National Aeronautics and Space Administration, Washington, D.C.

SECOND CENTAUR FLIGHT TEST (AC-2) SCHEDULED BY NASA News Release 63-254

Nov. 24, 1963 30 p

Available from NASA. Office of Scientific and Technical Information, Wash. D.C.

The second test flight of the Centaur space launch vehicle by the National Aeronautics and Space Administration is scheduled within the next several days according to NASA. The mission, designated AC-2, will be attempted from Cape Canaveral, Fla., no earlier than November 26. In this second developmental flight, Centaur will not carry a scientific payload. The burned-out Centaur second stage—weighing about five tons—will go into orbit, however, and the weight of a spacecraft will be simulated by developmental instruments located throughout the the vehicle to gather flight performance data. P.V.E.

N64-10419 Canadian Armament Research and Development Establishment, Valcartier

SUMMARY OF PERFORMANCE OF THE 15KS25000 ROCKET ENGINE USED IN THE FIRST SIXTEEN BLACK BRANT VEHICLES

C. D. Martin and A. Quellet Apr. 1963 10 p refs

(CARDE-TN-1525/63)

The performance of the 15KS25000 rocket engine used in the launching of the first sixteen Black Brant vehicles is outlined. Relevant data on the engine and vehicle are presented for each of the launchings, and explanatory comments are given for apparent deviations from normal performance. Results indicate some lack of reproducibility in the engine but a generally acceptable performance. Author

N64-10478 Joint Publications Research Service, Washington D.C.

ROCKET-MASTODON OR ORBITAL RENDEZVOUS

Yuriy Marinin Feb. 7, 1963 5 p refs Transl. into ENGLISH from Bakinskiy Rabochiy (Baku), no. 173, July 26, 1963 p 4 (JPRS-17524; OTS-63-21072) OTS: $0.50

A discussion of two methods of delivering a spaceship capable of a "soft" landing on the moon, takeoff from the moon, and returning to and landing on earth is presented. Such a spaceship would weight 50 to 100 tons. The methods proposed for getting to the moon are by means of the following: (1) huge rockets, "mastodons," almost 100 m in height and weighing several thousand tons, and (2) the building of relatively small rockets, with whose help the spaceship, in sections, would be placed in a low orbit around the earth. The separate parts of the ship would be joined in orbit. Following this, another rocket filled with fuel would be attached to the spaceship. This latter rocket would provide the necessary speed for the ship to escape from its orbit and reach the moon. R.T.K.

32 SPACE VEHICLES (SPACECRAFT)

Includes manned space capsules; satellites; and sounding rockets and space probes. *For boosters and launch vehicles see*: 31 Space Vehicles (Launch Vehicles). *For launch vehicle-spacecraft combinations see*: 30 Space Vehicles. *For related information see*: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

N64-10041* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

MANNED PLANETARY FLIGHT-WHERE ARE WE TODAY?

H. H. Koelle *In* Am. Inst. of Aeron. and Astronautics Eng. Problems of Manned Interplanetary Exploration Oct. 1963 p 1-2 (See N64-10040 01-01) AIAA: $4.00 members, $8.00 nonmembers

Some of the things listed as being known about manned planetary flight are that: (1) available resources will determine more than anthing else, when a major effort for the manned planetary program can begin; it is unlikely that this can be done before FY 1967; (2) chemical propulsion systems alone will certainly not be adequate to provide economical transportation for manned round trips to the planets, and (3) the manned planetary flight program can be considered only as a subprogram of the total national space flight program, and not an as an entity in itself. Things listed as not being known include: (1) whether artificial gravity is needed throughout most of the mission profile of a manned planetary flight; (2) the meteoroid and radiation distribution in space as a function of time accurate enough to make a detailed space vehicle design without great penalties, and (3) what, if any, role a lunar base might assume in the planetary program. P.V.E.

N64-10042* Aeronutronic, Newport Beach, Calif.

THE EMPIRE DUAL PLANET FLYBY MISSION

Franklin P. Dixon *In* Am. Inst. of Aeron. and Astronautics Eng. Problems of Manned Interplanetary Exploration Oct. 1963 p 3-18 refs (See N64-10040 01-01) AIAA: $4.00 members, $8.00 nonmembers

(NASA Contract NAS8-5025)

Mission analyses and spacecraft syntheses are reported for various methods of accomplishing a manned mission with close approach to both Venus and Mars and return to the

Earth in the 1970–72 period. Major systems requirements are defined and a Development Plan and Funding Schedule are presented for accomplishing the dual planet flyby using a nuclear engine for interplanetary injection from Earth orbit, taking up to 631 days, and providing for Earth return with a lifting reentry vehicle. Accelerated developments required to support such a mission are specified. Author

N64-10043* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ATMOSPHERE ENTRY PROBLEMS OF MANNED INTERPLANETARY FLIGHT
Alvin Seiff *In* Am. Inst. of Aeron. and Astronautics Eng. Problems of Manned Interplanetary Exploration Oct. 1963 p 19–33 refs (See N64-10040 01-01) AIAA: $4.00 members, $8.00 nonmembers

Three topics central to the problem of atmospheric entry in manned interplanetary flight are discussed: force and stability effects on entry bodies in gases other than air; radiative and convective heating in gas mixtures presently expected on Mars and Venus; and minimum heat-transfer configurations for Earth return and for Mars entry. P.V.E.

N64-10045* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ON THE UTILITY OF THE MOON IN SPACE TRANSPORTATION: THE LUNATRON CONCEPT
William J. D. Escher *In* Am. Inst. of Aeron. and Astronautics Eng. Problems of Manned Interplanetary Exploration Oct. 1963 p 102–112 refs (See N64-10040 01-01) AIAA: $4.00 members, $8.00 nonmembers

Lunatron is a coined name for the lunar-surface-based electromagnetically powered rail-launch concept. Since it is a non-jet-reaction device, its characteristics and capabilities contrast sharply with rocket systems. For mission applications requiring speeds considerably in excess of lunar escape, centripetal acceleration (as combined with the thrust-induced tangential component) becomes an intrinsically limiting factor. Both ac and dc drives appear feasible, and both should be initially explored. Among applicable current developments, the most impressive is British work with large linear induction motors leading toward the construction of high-speed domestic transportation systems. Author

N64-10110* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
MANNED SPACECRAFT CENTER VIEWPOINTS ON RELIABILITY AND QUALITY CONTROL
F. J. Bailey and R. R. Gilruth [1962] 11 p refs Presented at Aircraft Ind. Assoc. Quality Control Comm. Dinner, Houston, Tex. Nov. 15, 1962
(NASA TM X-51030) OTS: $1.60 ph, $0.80 mf

Reliability and control requirements are reviewed. Designs, procedures and schedules must have the flexibility to absorb a steady stream of changes generated by a continuously increasing understanding of space problems. Reliability, quality control, manufacturing, and procurement plans must all be set up with full recognition of this requirement for continuous hardware changes. Rapid corrective response to malfunctions throughout system development and preflight preparations must be made if schedules are to be met with hardware that is fit to fly. To the maximum extent possible, failure analysis and decisions as to corrective action must take place immediately at the scene of failure, where the availability of the part, the test set-up, and the people involved in the test, offers the best opportunity for accurate determination of the pertinent facts. All components, which require certification through a qualification test program, must be made up from sets of parts, the members of which have been produced consecutively on the same assembly line without an intervening change in design, process, or material. I.v.L.

N64-10114 Goodyear Aircraft Corp., Akron, Ohio
A NEW SYSTEM OF PROTECTION FROM HYPERVELOCITY PARTICLES
B. W. Reynolds and R. H. Emmons [1963] 31 p refs Presented at the 6th Hypervelocity Impact Symp., Cleveland, Apr. 30–May 2, 1963

Rigid and foldable meteroid protection systems for space structures have been experimentally evaluated. In light of the findings, it is proposed that a double-wall system incorporating a thin outer wall and a foam spacer attached to an inner structural wall be used. The foam spacer serves as a mechanical atmosphere tending to absorb and arrest the impacting materials through vaporization. These experimental tests and data do not support the conclusion of other investigators that the penetration resistance of polymeric materials (flexible fabrics) cannot compare with metals. Significant trends in materials and techniques for protecting against hypervelocity impacts are exhibited. Author

N64-10141* Smithsonian Astrophysical Observatory, Cambridge, Mass.
CATALOGUE OF SATELLITE OBSERVATIONS NO. C-34
Beatrice Miller July 17, 1963 54 p
(NASA Grant NsG-87-60)
(NASA CR-52454; SAO Special Rept.-130) OTS: $5.60 ph, $1.82 mf

Observations of the following satellites are presented: (A) 1958 Alpha (Explorer I) July 1 through December 31, 1962; (B) 1958 Beta 2 (Vanguard I) September 22 through October 18, 1962; (C) 1959 Alpha I (Vanguard II) July 1 through December 31, 1962; (D) 1959 Eta (Vanguard III) July 1 through Decmber 31, 1962; (E) 1959 Iota 1 (Explorer VII) July 1 through December 31, 1962; and (F) 1960 Gamma 2 (Transit 1B) September 29 through October 24, 1962. I.v.L.

N64-10332* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ARIEL I, THE FIRST INTERNATIONAL SATELLITE Project Summary
Robert C. Baumann Washington, NASA, 1963 84 p refs (NASA SP-43)

The Ariel I (1962 o 1) project summary document has been compiled to record the history of the first international satellite. The events leading up to the conception of Ariel I, the technical and management plans used in the project development, the scientific and engineering considerations employed in the design of the satellite and support equipment, and the design details of these components are described. A list of related documentation containing design information and experimental results is also included. Author

N64-10338* Aeronutronic, Newport Beach, Calif.
THE EFFECT OF BIAS AXIAL VELOCITIES AND ALTIMETER FUZING ALTITUDE ON RANGER IMPACT SURVIVABILITY Technical Report
Sept. 15, 1962 38 p refs
(JPL Contract N-21453)
(NASA CR-52540; Publication U-1826)

The various dispersions and error contributions which arise both in launch and transit guidance in the off-nominal performance of the Ranger landing capsule were solved by the

machine-model Monte-Carlo technique. Results indicate that arbitrarily imposed axial bias velocities greater than 60 ft/sec in either direction should not be used on the hard landing mission; the nominal burnout altitude altitude of Ranger 5 should be set at 1000 ft to obtain the highest overall survival probability in the range of ±60 ft/sec bias velocity; and an impact survival probability of at least 0.75 would result. R.T.K.

N64-10337* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE SITUATION REPORT, VOL. 3, NO. 20
Oct. 15, 1963 9 p
(NASA TM X-51120; X-583-63-1) OTS: $1.10 ph, $0.80 mf

The following information is presented concerning objects in orbit as of October 15, 1963: code name, source (U.S. or U.S.S.R.), launch data, nodal period, inclination, apogee, perigee, and transmitting frequency. The source, launch date, and decay date for an object which has decayed are also presented. P.V.E.

N64-10338* Jet Propulsion Lab. Calif. Inst. of Tech., Pasadena
FINAL REPORT ON MARINER 2 TEMPERATURE CONTROL
D. W. Lewis, M. B. Gram, R. J. Spehalski, and L. N. Dumas July 1, 1963 30 p
(NASA Contract NAS7-100)
(NASA CR-52463; JPL-TM-33-140) OTS: $2.60 ph, $1.10 mf

The basic principles and specific techniques of temperature control employed on the *Mariner R* spacecraft are presented. A chronological history of the thermal aspects of the *Mariner* 2 flight is given, including telemetry data for monitored components. The significance of the data in terms of improving temperature-control techniques is discussed. Author

N64-10343* Maryland U., College Park
VENUS AND THE MARINER
E. J. Opik, Repr. from Irish Astron. J. (Armagh), v. 6, no. 2, June 1963 p 59-67 refs
(NASA Grant NsG-58-60)

Observations relating to the surface conditions on Venus, which were obtained radiometrically (by radiation measurements, not by radio) during the Mariner II 35 minutes of fly-by, are discussed. Generally, the Mariner II microwave results agree with, or rather support, the "aeolospheric" model of a windswept planetary desert, heated by wind friction (and some trickle of internal heat) and screened by the dust-laden atmosphere. The sunlit side indicated a temperature of 400° K as opposed to 460° K for the dark side. This peculiar circumstance is explained by differences in ground level—a plateau on the sunlit side, rising above the level of the dark hemisphere by some 6 km. A constant surface trade wind must be blowing from the dark hemisphere towards the sunlit side. Sand and dust are transported by the wind in one direction, and very little is returned to the dark hemisphere by the upper current at or above cloudtop. This process must have been going on for billions of years. As a consequence, an enormous accumulation of dust deposit must, in such a case, have taken place on the sunlit hemisphere, at the expense of erosion on the dark side and on the terminator. I.v.L.

N64-10418 Hughes Aircraft Co., Culver City, Calif. Space Systems Division Branch Library
A SELECTED BIBLIOGRAPHY ON SATELLITE IDENTIFICATION, 1958-1963
H. Matsumiya, comp. Oct. 1963 8 p 59 refs
(LB-BIB-63-5)

N64-10438* Smithsonian Astrophysical Observatory, Cambridge, Mass.
CATALOGUE OF SATELLITE OBSERVATIONS NO. C-36 Research in Space Sciences
Beatrice Miller July 18, 1963 77 p
(NASA Grant NsG-87-60)
(NASA CR-52497; SAO Special Rept.-131) OTS: $7.60 ph, $2.51 mf

A catalogue of observations of the Echo I and Explorer VIII satellites and the Echo I rocket made by the Smithsonian Astrophysical Observatory during the period from July 1 through December 31, 1962 is given. The observations included are those from the SAO Baker-Nunn camera stations and Moonwatch teams, from U.S. and foreign observatories, military stations, Phototrack stations, and miscellaneous observers. D.E.R.

N64-10439* Smithsonian Astrophysical Observatory, Cambridge, Mass.
CATALOGUE OF SATELLITE OBSERVATIONS NO. C-36 Research in Space Science
Beatrice Miller July 19, 1963 83 p
(NASA Grant NsG-87-60)
(NASA CR-52504; SAO Special Rept.-132) OTS: $8.10 ph, $2.69 mf

A catalogue of observations of the Explorer IX, Transit 4A, Injun Solar Radiation 3, Telstar I, Explorer XV, Anna 1B, Relay 1, and Explorer XVI satellites made by the Smithsonian Astrophysical Observatory during the period from July 1 to December 31, 1962 is given. The observations included are those from the SAO Baker-Nunn camera stations and Moonwatch teams, from U.S. and foreign observatories, military stations, Phototrack stations, and miscellaneous observers. Material available for certain other satellites, 1962 Alpha Epsilon 2, Alpha Psi 1, Beta Gamma 1, and Beta Upsilon 2, is insufficient to determine satellite orbits and is not included in this report. D.E.R.

N64-10625* General Mills, Inc., Minneapolis, Minn. Electronics Div.
INVESTIGATION OF SPUTTERING EFFECTS ON THE MOON'S SURFACE
G. K. Wehner, D. L. Rosenberg, and C. E. KenKnight Nov. 12, 1963 30 p refs
(NASA Contract NASw-751)
(NASA CR-52534) OTS: $2.60 ph, $1.10 mf

Experiments to investigate the influence of sputtering of the lunar surface by the solar wind were continued. Enrichment of metal concentration in surface layers of metallic oxides under hydrogen and mercury bombardment was demonstrated by X-ray scattering from the powders. An optical device for measurements of powder reflectivities is described and employed to measure the reflectivity of various materials. Powder surfaces sputtered under normal ion incidence are changed toward better agreement with the lunar results. Most surfaces are simultaneously darkened, in agreement with the low lunar albedo. Crusts of copper oxides after sputtering had high electrical conductivity. Buildup of copper oxide crusts from falling powder during sputtering resulted in cementing not otherwise observed. Sputtering of Fe, Ni, and Au wires by mass-analyzed beams of hydrogen molecular ions support the theoretically expected sec θ dependence upon angle of incidence for 2 to 4 kev protons. Author

N64-10649 Joint Publications Research Service, Washington, D.C.
THE GENERALIZED PROBLEM OF TWO FIXED CENTERS AND ITS APPLICATION FOR ARTIFICIAL EARTH SATELLITES
Ye. P. Aksenov, Ye. A. Grebenikov, and V. G. Demin May 16, 1963 17 p refs Transl. into ENGLISH of an article from Astron. Zhur. (Moscow), v. 40, no. 2, Mar.–Apr. 1963 p 363–372
(JPRS-19225; OTS-63-21832) OTS: $0.50

A solution is obtained for the problem of two fixed centers, under the condition that the masses of the attracting centers and the distance between them are complex values, and that the potential assumes only real values at any position of the moving point in space. It is shown that such a generalization allows for the two fixed centers problem to be successfully applied in the theory of motion of artificial earth satellites. Author

33 STRESSES AND LOADS

Includes fatigue; vibration; flutter; and structural tests. *For thermal stress see*: 13 Heat Transfer and Thermodynamics. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 34 Structural Design.

N64-10122 Joint Publications Research Service, Washington, D.C.
EFFECT OF STRESSES ON THE QUALITY OF SILICIDE COATINGS ON MOLYBDENUM, USSR
V. Ye. Ivanov, Ye. P. Nechiporenko, A. D. Osipov, and V. I. Zmiy Nov. 6, 1963 9 p refs Transl. into ENGLISH of an article from Fiz. Metal. i Metalloved. (Sverdlovsk, USSR), v. 14, no. 4, Oct. 1962
(JPRS-21758; OTS-63-41079) OTS: $0.50

The appearance of defects in silicide layers on a molybdenum substrate is investigated as a function of the change in stresses with variations in temperature. The cracks and other defects are found to be the result of the difference in the coefficients of expansion of the silicide layer and the molybdenum. It is also shown that cyclic heating greatly reduces the protective properties of silicide antioxidant coatings. The formula for determining the total stress in the silicide layer is given as:

$$S = 4d/3L^2h(E_2h^3{}_2/h_1 + E_1h_1/4h - h_2/).$$ D.E.R.

N64-10159 Entwicklungsring Sud, Munich (W. Germany)
DEVELOPMENT POSSIBILITIES FOR CONTROLLING ACOUSTICALLY INDUCED STRUCTURAL FATIGUE [ENTWICKLUNGSMOGLICHKEITEN ZUR BEHERRSCHUNG DER STRUKTURERMUDUNG DURCH AKUSTISCHE ANREGUNG]
Alfred Schneider July 1963 24 p refs In GERMAN
(EWR-/73/63)

The possibility of controlling acoustically induced structural fatigue is investigated. Results indicate that the acoustical fatigue problem can be solved by providing a true collective load in conjunction with a suitable research and simulation technique. The required research and simulation stages are classified as follows: (1) type-bound construction-methods investigation at design and construction stages; (2) the provision of a structural collective load for a representative flight operation immediately after the flight readiness of the prototype; (3) the simulation of the information ascertained in (2), and when necessary modified collective loads, in a sound-resistant laboratory, and a subsequent life-span index. Trans. by I.v.L.

N64-10170 Bettis Atomic Power Lab., Pittsburgh, Pa.
THE FATIGUE STRENGTH OF MEMBERS CONTAINING CRACKS
W. J. O'Donnell and C. M. Purdy [1963] 36 p refs Presented at Petrol. Div. Conf., Tulsa, Okla., Sept. 22–25, 1963
(WAPD-T-1495)

The significant loss of fatigue life due to the presence of a crack, crack-like defect, or sharp notch is predicted from theoretical considerations. Fatigue notch factors are given as functions of the crack depth, section width, and type of loading. These values are applicable where defects of a particular depth are known to exist, or where defects of a limited depth could exist without being detected. Although these values apply specifically to 100,000-psi tensile strength steels, they are conservatively high for lower strength steels, aluminum, and other materials which are less sensitive to notches. Author

N64-10175* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
THE ROLE OF ELASTOHYDRODYNAMIC LUBRICATION IN ROLLING-CONTACT FATIGUE
E. V. Zaretsky, L. B. Sibley (Battelle Memorial Inst.), and W. J. Anderson Repr from J.Basic Eng., Trans., ASME, Sept. 1963 p 439–450 refs
(NASA RP-43; ASME Paper 62-Lub-4)

The five-ball fatigue tester was used to determine the rolling-contact fatigue life of 1/2-in.-diam. M-1 steel balls with four lubricants at 300° F. Film thickness measurements were made with the rolling-contact disk machine under simulated five-ball test conditions. Under certain conditions, elastohydrodynamic lubrication was found to exist at initial, maximum, Hertz stress levels up to 800,000 psi. There appears to be a correlation among the following variables: plastically deformed profile radius of the ball specimen at ambient temperature; lubricant type; and rolling-contact fatigue. No correlation was found between contact temperature obtained with different lubricants and fatigue life. Author

N64-10244 Watertown Arsenal, Mass.
CRACK STRESSES: AN APPLICATION OF MUSKHELISHVILI'S EXTENSION PRINCIPLE FOR MULTIVALUED MAPPING FUNCTIONS
Oscar L. Bowie Mar. 1963 10 p refs
(WAL TR 811.8/4; AD-400687)

Muskhelishvili's extension principle for the case of geometries involving corners and cracks and hence multivalued mapping functions is considered. It is shown that a useful application of the procedure can be found in the study of the local stress distribution near the base of a crack. The structures of the stress functions on the Riemann surface defining the mapping function in the neighborhood of σ_o corresponding to the crack root can be found, and the local stress distribution shown to depend on $\phi'(\sigma_o)$. Author

N64-10258 Advisory Group for Aeronautical Research and Development, Paris (France)
CRITICAL STUDY ON FATIGUE CRACK PROPAGATION
W. Barrois July 1962 57 p refs
(AGARD-412)

The first section of this study discusses the various solutions, based on the theory of elasticity, for the stress field around the tip of a crack, and defines the limit conditions in this connection. Further, it compares the solutions put forward by different authors for infinite and finite plates, respectively, and those solutions retained with the corresponding photoelastic results. The second section sums up basic knowledge to date on the elastic–plastic transformation of a material under fatigue, the onset of superficial cracking, and the propagation of the crack considered from the point of view of the physical process involved. The third section is devoted to an analysis of the quantitative aspect of crack propagation. An account is given of dispersion in the three following fields: crack rate, number of cycles to rupture, and residual strength. The effects of the following factors are studied: alternating stresses, materials, overloading/preloading, frequency, and scale. Author

N64-10305* Southwest Research Inst., San Antonio, Tex.
BENDING VIBRATIONS OF A CIRCULAR CYLINDRICAL SHELL WITH AN INTERNAL LIQUID HAVING A FREE SURFACE
Ulric S. Lindholm, Wen-Hwa Chu, Daniel D. Kana, and H. Norman Abramson Repr. from AIAA Journal, v. I, no. 9, Sept. 1963 p 2092–2099 refs Presented at IAS 31st Ann. Meeting, New York, Jan. 21–23, 1963
(NASA Contract NASw-146)

Resonant bending frequencies and mode shapes were determined experimentally for a thin, circular, cylindrical shell containing an internal liquid with a free surface. The measured increase in frequency between uncapped and capped partially filled tanks of two different end conditions are generally in agreement with theoretical predictions. Differences between theory and experiment are attributed primarily to variations of actual mode shapes from those assumed in the theory. This is true for both cantilever and pin-ended tanks, with the latter being even more complicated by a strong dependence of mode shape on liquid depth. Significant coupling occurred between bending and breathing shell responses, becoming increasingly important with decreasing tank-fineness ratio. Author

N64-10400* National Aeronautics and Space Administration, Washington, D.C.
RESEARCH ON PANEL FLUTTER
D. R. Kobett and E. F. E. Zeydel (Midwest Research Inst.) Nov. 1963 54 p refs
(NASA Contract NASr-63(05))
(NASA TN D-2227) OTS: $1.50

A theoretical parametric study is conducted of the flutter characteristics of simply supported flat panel arrays extending to infinity in the spanwise direction, and to one panel in the chordwise direction. Small deflection plate theory and exact, linearized, three-dimensional aerodynamic theory are used. Critical stability boundaries are computed for a wide variety of panel materials and altitudes, in the Mach number range 1.1 to 2.0 and the length–width ratio range 1/4 to 4. Author

N64-10462 Technisch Documentatie en Informatie Centrum Voor de Krijgsmacht, The Hague (Netherlands)
BIBLIOGRAPHY, SHOCK AND VIBRATION ABSORPTION IN PACKAGING [BIBLIOGRAFIE SCHOK EN TRILLINWERING IN VERPAKKING]
L. J. van der Toorn Nov. 1961 263 p refs
(TDCK-28650)

This biliography contains abstracts of articles and reports on theory of shock, vibration, and damping. Attention is paid to the analysis of mechanical influences occurring during shipment, storage, and operational conditions. Part of the bibliography deals with test methods and measuring equipment. Obtained results are given. Extensive information is gathered on cushioning materials and shock- and vibration-resistant constructions as used in packaging techniques. Items on properties of materials are compiled. References on isolators against shock and vibration used for the protection of apparatus aboard ships, aircraft, and guided missiles are also included. Literature on air drop operations is presented. Author

N64-10542 Aerojet-General Corp., Azusa, Calif. Structural Materials Div.
STRESS-CORROSION CRACKING OF HIGH-STRENGTH ALLOYS Quarterly Report [Jan. 1-Mar. 31, 1963]
R. B. Setterlund May 1963 58 p refs
(Contract DA-04-495-ORD-3069)
(Rept. 0414-01-9; AD-405898)

Test results showed that 6Al-4V titanium alloy is immune to stress–corrosion cracking in the annealed, quenched-and-aged, and as-welded conditions. The 20%-nickel grade of maraging steel was found to be highly susceptible to stress-corrosion cracking in the annealed-and-aged condition. This same alloy, when cold-worked 50% to 75% before aging, was found to be only mildly susceptible to stress–corrosion cracking. The welded-and-aged alloy was found to be extremely susceptible to stress–corrosion cracking in the weld-heat-affected zone. The 18%-nickel grade of maraging steel was also found to be susceptible to stress–corrosion cracking, which was found to occur more rapidly in the annealed-and-aged material than in the 50% cold-worked-and-aged material. Author

N64-10543 Aerojet-General Corp., Azusa, Calif. Structural Materials Div.
INVESTIGATION OF STRESS-CORROSION CRACKING OF HIGH-STRENGTH ALLOYS [Informal Monthly Progress Report 22, Feb. 1-Feb. 28, 1963]
R. B. Setterlund May 1963 12 p
(Contract DA-04-495-ORD-3069)
(L0414-01-22; AD-404215) OTS: $1.60

Results obtained to date indicate that the 6Al-4V titanium alloys is immune to stress-corrosion cracking, under the test conditions of this program, in both the annealed and the quenched-and-aged conditions. The 20%-nickel maraging steel was found to be highly susceptible to stress-corrosion cracking in the annealed-and-aged condition. When the same material was cold-worked before aging, however, the resistance to stress-corrosion cracking was greatly increased. The 18%-nickel maraging steel also found to be susceptible to stress-corrosion cracking. As with the 20%-nickel steel, it was found that prior cold working decreased the stress-corrosion cracking susceptibility. Author

34 STRUCTURAL DESIGN

Includes structural elements; and weight analysis. *For related information see*: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 33 Stresses and Loads.

N64-10004 Douglas Aircraft Co., Inc., Santa Monica, Calif. Missile and Space Systems Div.
STRUCTURAL DESIGN CONSIDERATIONS FOR FIBER GLASS PRESSURE VESSELS

John T. Hofeditz Jan. 1963 32 p refs Presented at the Soc. of the Plastics Industry, Chicago, 1963
(Eng. Paper 1415)

Design methods used for fiber glass pressure vessels are presented and compared to those used for metal pressure vessels. Both the netting theory and orthotropic analysis methods are discussed, and their application to the solution of design problems is illustrated. Attention is given to the determination of dome shapes, geodesic paths, discontinuity stresses at dome-cylinder junctions and at polar openings. Author

N64-10083 General Dynamics/Astronautics, San Diego, Calif.
LINEAR BENDING ANALYSIS OF A PRESSURIZED MULTICELL SHELL STRUCTURE
Paul E. Wilson, Sangiah Dharmarajan, and Philip W. Rogers Sept. 30, 1963 34 p refs
(GD/A 63-0968)

An approximate analysis of the stresses and deflections in the webs and partial cylinders of a uniformly pressurized multicell container of monocoque construction is presented. Linear bending theory of circular cylindrical shells serves as the basic mathematical model. Nondimensional closed form solutions of the governing differential equations are presented. An extensive parametric study employing an IBM 7094 digital computer was carried out, and the overall structural behavior of many tank geometries was evaluated numerically. Author

N64-10093* Goodyear Aircraft Corp., Akron, Ohio
STUDY ON METHODS OF STRUCTURALLY EVALUATING EXPANDABLE STRUCTURES HAVING POTENTIAL SPACE APPLICATIONS Quarterly Progress Report Number One, 1 Aug.-1 Nov. 1962
N. L. Jeppesen, B. W. Reynolds, N. C. Costakos, N. E. Houtz, and E. Rottmayer Nov. 30, 1962 118 p
(NASA Contract NASw-471)
(NASA CR-52077; GER 10882 Rev. A; supersedes and cancels GER 10882 dated Nov. 10, 1962) OTS: $9.60 ph, $3.74 mf

Major areas in which studies were initiated are: (1) determination of the important parameters that affect the weight of expandable structures; (2) the relationship of these parameters to the total structural weight; (3) the effect of shape and method of construction on structural weight; (4) the possibility of using the cumulative damage theory to determine safety factors; (5) significance of long-time loading (creep) on design of expandable structures. Author

N64-10232 Deutsche Forschungsanstalt für Luft-Und Raumfahrt, Brunswick (W. Germany) Inst. für Fluzeugabau
THE DETERMINATION OF THE SPECIFIC CRACK STRENGTH BY THE JOINT PEELING TEST [DIE ERMITTLUNG DER SPEZIFISCHEN ANRISSKRAFT BEIM WINKELSCHALVERSUCH]
O. Heise Aug. 8, 1963 16 p refs In GERMAN
(DFL-196)

The test specimen for the peeling joint test was idealized as an elastic embedded beam, where the adhesive of the roller was the bedding. A dimensionless representation of the peeling strength and the peeling moment was given as a function of a dimensionless parameter, which contained all of the characteristic magnitudes of the adhesive joint. The use of the nonlinear theory caused a considerable increase in the calculated cracking strengths as opposed to the linear theory, thereby approaching more nearly the experimental values.
Trans. by I.v.L.

N64-10309* Northrop Corp., Hawthorne, Calif. Space Labs.
CONCEPTUAL INVESTIGATIONS OF VARIABLE GEOMETRY SPACE STRUCTURES Final Report
M. Lebovits, H. L. Suata, C. F. King, and J. W. Young May 1963 178 p refs
(NASA Contract NASr-114)
(NASA CR-52484; NSL-63-115) OTS: $12.50 ph, $5.54 mf

A conceptual investigation of a number of variable geometry (VG) structures was made to establish their geometric, structural, and deployment characteristics. The systems evaluated were the following rigidized VG structures: frame, panel, integrated panel and frame, and panel-sphere. The study concludes that the rigidized VG structure possesses considerable versatility and potential usefulness as a space system structure. Author

N64-10345 General Dynamics/Astronautics, San Diego, Calif.
A SPECIALIZED TOROIDAL PRESSURE VESSEL
C. E. Edenfield and J. Kinsley Lowry Oct. 1, 1963 37 p refs
(ERR-AN-174)

A method is developed for determining the meridional contours of a toroidal shell which will produce no hoop stress resultants in the curved portion of the shell when subjected to internal pressure. The meridional membrane force will remain tensile. The resulting specialized toroidal pressure vessel design may eliminate the possibility of buckling failures found to be of critical concern in many other types of noncircular tori. Methods for finding the internal volume and surface area of such a pressure vessel are also presented. Author

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